Rectification of West Coast Chiton Nomenclature

(Mollusca : Polyplacophora)

BY

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For many years, malacologists interested in the large chiton fauna occurring along the West Coast of North America have found identification of a number of described species difficult, if not impossible. This is because the original descriptions of some are totally inadequate and also because the type specimens of these and others never have been illustrated. Included among such species are several described by Philip P. Carpenter and a number of others described by William H. Dall, especially in the latter's "Descriptions of new species of chitons from the Pacific Coast of America" published in 1919 by the United States National Museum of Natural History.

In order to alleviate the current difficulties with identifications of West Coast chitons, I started several years ago a program of borrowing type specimens, a few at a time, for study purposes. At the same time, in order to have a permanent record, I made 35 mm color transparencies of whole specimens where possible and of valves or valve fragments separately where types had been disarticulated or were damaged or incomplete. These color slides have been deposited in the Color Slide Series of the Department of Invertebrate Zoology, California Academy of Sciences, San Francisco (CASIZ), and thus are available for study or duplication as may be desired.

Chiton types have been loaned by the Division of Mollusks, United States National Museum of Natural History, Washington, D.C., through the courtesy of Drs. Harald Rehder, Joseph Rosewater, and Clyde F. E. Roper; by the Academy of Natural Sciences of Philadelphia through the courtesy of Dr. Robert Robertson and Mrs. Virginia Orr Maes; by the Peter Redpath Museum, McGill University, Montreal, Canada, through the courtesy of Dr. Vincent Condé; and by the San Diego Museum of Natural History (San Diego Society of Natural History) through the courtesy of its now retired Curator of Mollusks, Mr. Emery P. Chace. The interest shown and the assistance afforded by these respective curators of the various type repositories is acknowledged with appreciation and thanks.

Conclusions reached from a study of the type specimens and other pertinent evidence are summarized in Table 1, which lists the name as originally published and the equivalent name now believed to be appropriate. Of a total of 76 species names considered, 47 are reduced to the status of synonyms, which results in a considerable simplification of West Coast chiton nomenclature. Of the remaining 29 names, 4 are left in the category of *nomina inquirenda* for future taxonomic determination. The balance of 25 names require no taxonomic changes at the species level. Type specimens for a number of the latter were borrowed for comparison with other related types, to confirm the correctness of our modern concepts of these species, and to provide a photographic record on 35 mm color slides for reference purposes. In a few instances, it was not considered necessary to borrow available type specimens inasmuch as reasonable taxonomic conclusions could be arrived at from the evidence already available, without recourse to the actual types. As will be evident from a review of Table 1, it has been necessary to change generic and even family assignments from those proposed originally.

No attempt has been made to cover all chiton species occurring along the West Coast of the Americas in this report, which has been limited, for the most part, to those living along the coasts of California, the Pacific Northwest, including Alaska, with the addition of a few from the Panamic Faunal Province. This is true particularly for species in the family Lepidopleuridae, which likewise are difficult to identify for lack of adequate illustrations or other information based on type or authoritatively-identified specimens.

In reaching conclusions on West Coast chiton nomenclature I have had much assistance from several sources over a considerable period of time in addition to the opportunity to work with actual type specimens. In connection with her study of Carpenter's types in the Redpath Museum, Dr. Katherine V. W. Palmer furnished me with

Table 1

Original Name	Current Equivalent
ISCHNOCHITONIDAE	
Ischnochiton acelidotus Dall, 1919	*Ischnochiton acelidotus* Dall, 1919
Ischnochiton (Radsiella) aethalotus Dall, 1919	*Ischnochiton (Radsiella) tridentatus* Pilsbry, 1893
Ischnochiton (Stenoplax) aethonus Dall, 1919	*Stenoplax aethona* (Dall. 1919)
Ischnochiton (Ischnochiton) aureotinctus Carpenter in Pilsbry, 1892	A *nomen inquirendum*
Ischnochiton berryi Dall, 1919	*Lepidozona sinudentata* (Carpenter in Pilsbry, 1892)
Ischnochiton biarcuatus Dall, 1903	*Stenoplax corrugata* (Carpenter in Pilsbry, 1892)
Ischnochiton brunneus Dall, 1919	*Lepidozona pectinulata* (Carpenter in Pilsbry, 1893)
Ischnochiton bryanti Dall, 1919	*Lepidozona pectinulata* (Carpenter in Pilsbry, 1893)
Ischnochiton (Lepidozona) californiensis Berry, 1931	*Lepidozona pectinulata* (Carpenter in Pilsbry, 1893)
Ischnochiton (Lepidozona) catalinae Willett, 1931	*Lepidozona willetti* (Berry, 1917)
Ischnochiton cooperi acutior Carpenter in Dall, 1919	*Lepidozona cooperi* (Pilsbry, 1892)
Ischnochiton (Ischnochiton) corrugatus Carpenter in Pilsbry, 1892	*Stenoplax corrugata* (Carpenter in Pilsbry, 1892)
Ischnochiton (Ischnochiton) decipiens Carpenter in Pilsbry, 1892	*Lepidozona sinudentata* (Carpenter in Pilsbry, 1892)
Chiton dentiens Gould, 1846	*Cyanoplax dentiens* (Gould, 1846)
Ischnochiton eucosmius Dall, 1919	*Ischnochiton eucosmius* Dall, 1919
Ischnochiton exanthematus Dall, 1919	*Ischnochiton acelidotus* Dall, 1919
Ischnochiton (Lepidozona) gallina Berry, 1925	*Lepidozona sinudentata* (Carpenter in Pilsbry, 1892)
Ischnochiton (Lepidozona) golischi Berry, 1919	*Lepidozona scabricostata* (Carpenter, 1864)
Chiton interstinctus Gould, 1846	*Ischnochiton interstinctus* (Gould, 1846)
Ischnochiton listrum Dall, 1919	*Lepidozona sinudentata* (Carpenter in Pilsbry, 1892)
Ischnochiton mariposa Dall, 1919	*Ischnochiton petaloides* (Gould, 1846)
Ischnochiton (Ischnochiton) newcombi Carpenter in Pilsbry, 1892	*Ischnochiton newcombi* Carpenter in Pilsbry, 1892
Ischnochiton ophioderma Dall, 1908	*Ischnochiton dispar* (Sowerby, 1832)
Lepidopleurus pectinulatus Carpenter in Pilsbry, 1893	*Lepidozona pectinulata* (Carpenter in Pilsbry, 1893)
Chiton petaloides Gould, 1846	*Ischnochiton petaloides* (Gould, 1846)
Leptochiton punctatus Whiteaves, 1886	*Lepidozona retiporosa* (Carpenter, 1864)
Ischnochiton (Ischnochiton) radians Carpenter in Pilsbry, 1892	*Ischnochiton interstinctus* (Gould, 1846)
Ischnochiton (Trachydermon) retiporosus Carpenter, 1864	*Lepidozona retiporosa* (Carpenter, 1864)
Ischnochiton ritteri Dall, 1919	*Ischnochiton (Tripoplax) trifidus* (Carpenter, 1864)
Ischnochiton sarcosus Dall, 1919	*Stenoplax conspicua* (Carpenter in Dall, 1879)
Ischnochiton (Lepidopleurus) scabricostatus Carpenter, 1864	*Lepidozona scabricostata* (Carpenter, 1864)
Ischnochiton (Ischnochiton) sinudentatus Carpenter in Pilsbry, 1892	*Lepidozona sinudentata* (Carpenter in Pilsbry, 1892)
Ischnochiton stearnsii Dall, 1902	*Ischnochiton stearnsii* Dall, 1902
Ischnochiton (Ischnochiton) subclathratus Pilsbry, 1893	*Lepidozona clathrata* (Reeve, 1847)
Ischnochiton (Trachydermon) trifidus Carpenter, 1864	*Ischnochiton (Tripoplax) trifidus* Carpenter, 1864
Ischnochiton venezius Dall, 1919	*Lepidozona retiporosa* (Carpenter, 1864)
Ischnochiton veredentiens Carpenter, 1864	A *nomen inquirendum*
Ischnochiton (Lepidozona) willetti Berry, 1917	*Lepidozona willetti* (Berry, 1917)
SCHIZOPLACIDAE	
Schizoplax multicolor Dall, 1920	*Schizoplax brandtii* (Middendorff, 1847)

Table 1 (continued)

Original Name	Current Equivalent
CALLISTOPLACIDAE	
Callistochiton acinatus Dall, 1919	*Callistochiton palmulatus* Carpenter in Pilsbry, 1893
Callistochiton celetus Dall, 1919	*Callistochiton palmulatus* Carpenter in Pilsbry, 1893
Callistochiton chthonius Dall, 1919	*Callistochiton decoratus* Pilsbry, 1893
Callistochiton connellyi Willett, 1937	*Callistochiton palmulatus* Carpenter in Pilsbry, 1893
Callistochiton cyanosus Dall, 1919	*Callistochiton decoratus* Pilsbry, 1893
Callistochiton decoratus punctocostatus Pilsbry, 1896	*Callistochiton decoratus* Pilsbry, 1893
Callistochiton fisheri Dall, 1919	A *nomen inquirendum*
Acanthopleura fluxa Carpenter, 1864	*Nuttallina fluxa* (Carpenter, 1864)
Callistochiton periconis Dall, 1908	*Callistochiton pulchellus* (Gray, 1828)
CHAETOPLEURIDAE	
Lepidopleurus bullatus Carpenter, 1857	*Chaetopleura (Chaetopleura) lurida* (Sowerby, 1832)
Lepidopleurus bullatus calciferus Carpenter, 1857	*Chaetopleura (Chaetopleura) lurida* (Sowerby, 1832)
Callistochiton duncanus Dall, 1919	*Calloplax duncana* (Dall, 1919)
Chiton jaspideus Gould, 1846	*Chaetopleura (Chaetopleura) hennahi* (Gray, 1828)
Nuttallina magdalena Dall, 1919	*Chaetopleura (Pallochiton) lanuginosa* (Carpenter in Dall, 1879)
Ischnochiton marmoratus Dall, 1919	*Chaetoplura (Chaetopleura) gemma* Dall, 1879
Tonicia mixta Dall, 1919	*Chaetopleura (Chaetopleura) mixta* (Dall, 1919)
Ischnochiton parallelus Carpenter, 1864	*Chaetopleura (Chaetopleura) lurida* (Sowerby, 1832)
Ischnochiton prasinatus Carpenter, 1864	*Chaetopleura (Chaetopleura) lurida* (Sowerby, 1832)
MOPALIIDAE	
Callistochiton aepynotus Dall, 1919	*Mopalia sinuata* Carpenter, 1864
Mopalia celetoides Dall, 1919	*Mopalia imporcata* Carpenter, 1864
Mopalia chloris Dall, 1919	*Mopalia acuta* Carpenter, 1855
Mopalia goniura Dall, 1919	*Mopalia sinuata* Carpenter, 1864
Ischnochiton (Trachydermon) gothicus Carpenter, 1864	*Dendrochiton gothicus* (Carpenter, 1864)
Mopalia (Semimopalia) grisea Dall, 1919	*Mopalia (Semimopalia) grisea* Dall, 1919
Mopalia imporcata Carpenter, 1864	*Mopalia imporcata* Carpenter, 1864
Mopalia kennerleyi Carpenter, 1864	*Mopalia ciliata* (Sowerby, 1840)
?Chaetopleura lactica Dall, 1919	*Mopalia acuta* Carpenter, 1864
Mopalia lowei Pilsbry, 1918	*Mopalia lowei* Pilsbry, 1918
Mopalia pedroana Willett, 1932	*Mopalia acuta* Carpenter, 1864
Chaetopleura rosetta Bartsch MS	*Dendrochiton thamnoporus* Berry, 1911
Mopalia sinuata Carpenter, 1864	*Mopalia sinuata* Carpenter, 1864
Placiphorella borealis Pilsbry, 1893	*Placiphorella borealis* Pilsbry, 1893
Chiton (Molpalia) stimpsoni Gould, 1859	*Placiphorella stimpsoni* (Gould, 1859)
CHITONIDAE	
Nuttallina allantophora Dall, 1919	*?Liolophura japonica* (Lischke, 1873)
Tonicia pustulifera Dall, 1919	A *nomen inquirendum*
Lophyrus striatosquamosus Carpenter, 1857	*Chiton articulatus* Sowerby, 1832
ACANTHOCHITONIDAE	
Acanthochitona angelica Dall, 1919	*Acanthochitona avicula* (Carpenter, 1864)

a set of black-and-white prints enlarged from negatives taken of a number of Carpenter's types in that Museum. In 1947, Dr. S. Stillman Berry of Redlands, California, visited the United States National Museum of Natural History with the objective, among others, of studying Carpenter's and Dall's unfigured chiton types. He prepared a set of notes covering his conclusions based on this study for his personal use and gave me a copy for my own information, for which I am greatly indebted. Although Dr. Berry's conclusions were preliminary and not meant for publication, his taxonomic allocations have proved to be correct, for the most part, and many of my own conclusions from a subsequent analysis of the same type specimens are reflections of them. Also, I have had the advantage of receiving a set of black-and-white prints of chiton types in the United States National Museum of Natural History from negatives made in 1962 by Dr. James H. McLean of the Department of Invertebrate Zoology, Los Angeles County Museum of Natural History, during a visit to the Division of Mollusks for the purpose of photographing type specimens of marine mollusks, including the chitons. In addition, during a visit to the British Museum of Natural History in London, Dr. Myra Keen of the Department of Geology, Stanford University, made photographs and sketches of several West Coast chiton types in that Museum. Finally, I have had the benefit of taxonomic conclusions arrived at more recently by Dr. Antonio J. Ferreira of San Jose, California, based on chiton types he has borrowed in connection with his current study of species in the genus *Lepidozona* and of others from the West Coast of North America. He has taken 35 mm color transparencies of types and other specimens, which he has also been good enough to deposit in the CASIZ Color Slide Series of the California Academy to supplement as well as to duplicate some of my own slides.

No complete, annotated, up-to-date list of the chitons of the West Coast is currently available. The most comprehensive lists that have been published recently are by Burghardt and Burghardt (1969b), limited to species occurring for the most part from southern California north to Alaska; by Thorpe (in Keen, 1971), covering chitons living in the Panamic Faunal Province; and by Abbott (1974), covering both Atlantic and Pacific Coast species. These authors have done some synonymizing of West Coast chiton names without providing background information for making such taxonomic changes although some of them turn out to be correct assignments. The following discussions of species-name relationships aim to provide objective data supporting these and other taxonomic changes in order to place the West Coast chiton fauna in a sounder and more realistic perspective.

TAXONOMIC NOTES

Family ISCHNOCHITONIDAE Dall, 1889

Ischnochiton acelidotus Dall, 1919

Ischnochiton acelidotus Dall, 1919:506

Holotype: U.S.N.M. No. 122731.

Type locality: "Magellan Straits in 77½ fathoms, ooze, bottom temperature 46.9°, United States Fish Commission steamer *Albatross*."

Remarks: This medium-sized species is based on a single specimen preserved dry with the animal intact; it is somewhat curled. Dall's description of both sculptural and girdle characters is adequate. He did not attempt to disarticulate the type but compromised by exposing the ends of the head and tail valves, evidently while the animal was still in alcohol, so as to bare the insertion plates for a count of the slits and teeth. Dall says "the pleural tracts have six to eight widely spaced slender axial threads," which I would term longitudinal lirations, and which, to me, seem to be placed in such a manner as to give the pleural areas a "clap-boarded" aspect.

The girdle ornamentation is unlike any that I am familiar with for West Coast species of *Ischnochiton*. Dall's characterization of them as small spinules is apt as they are very different from the usual type of elongate-ovate, overlapping girdle scales occurring in species allocated to the genera *Ischnochiton* and *Lepidozona*. They are quite elongate, closely packed, and arranged in a position almost perpendicular to the basal plane of the girdle. Somewhat similar girdle ornamentation occurs on the deep-water species *Ischnochiton stearnsii* Dall, 1902, and *I. abyssicola* Smith & Cowan, 1966, the dorsal surfaces of which present a "pebbly" appearance to the girdles due to the rounded tops of the individual "scales" in these two species.

Dr. Antonio Ferreira, who has borrowed the types of both *Ischnochiton acelidotus* and *I. exanthematus* Dall, 1919, for study, has concluded that these two forms are conspecific. After studying the types myself, I have come to the same conclusion. It is difficult to see why Dall described the two type specimens as belonging to different species not only because of the conchological characters, which are practically identical, but also because both were dredged in the same general area (the Straits of Magellan) in approximately the same depths (77½ fathoms [142 m] for *I. acelidotus* and 61 fathoms [112 m] for *I. exanthematus*.

Despite the fact that *Ischnochiton exanthematus* has page priority, I would treat this species as a synonym of *I. acelidotus* because the type specimen of the latter species is larger and exhibits the characters of this South American chiton somewhat better than the type of *I. exanthematus*. Color slides of the type specimen are CASIZ Nos. 3140-3144 (AGS and No. 3150 (Ferreira)).

The taxonomic position of *Ischnochiton acelidotus* in the family Ischnochitonidae is uncertain. It, *I. stearnsii* and *I. abyssicola* do not appear to be at all closely related to other West Coast Ischnochitons. Eventually, a new subgeneric or possibly a generic taxon may have to be created in order to accommodate them.

Ischnochiton (Radsiella) aethalotus Dall, 1919

Ischnochiton (Radsiella) aethalotus Dall, 1919:508-509. Keen, 1958:522.
Ischnochiton aethalotus Dall, 1919. Thorpe (*in* Keen, 1971): 869 (syn. of *Radsiella tridentata* (Pilsbry, 1893)).

Holotype: U.S.N.M. No. 55806c.

Type locality: "Gulf of California (Fisher)".

Remarks: The holotype measures; length, 12; width, 6; height, 2 mm. It has been disarticulated, with valves i, ii, vii, and viii separate. Few, if any of the girdle scales remain. The slit-formula is given as 18 - 2 - 11 but the head valve actually has 13 slits, a difference that may be within the limits of individual variation, or what seems more likely, a typographical error the original 13 being printed as 18. Dall makes the particular point in his description of the "relatively large brownish (ocular) pustules" that are scattered irregularly over all the valves. These definitely are adventitious; they can be rubbed off and are not part of the valve tegmentum structure.

Study of the holotype leaves no doubt of the fact that Dall has re-described a subadult specimen of *Ischnochiton (Radsiella) tridentatus* Pilsbry, 1893, which is a common species occurring in the upper Gulf of California. Although placed in the synonymy of *I. tridentatus by* Thorpe (*in* Keen, 1971) with no supporting evidence for such a step, this allocation now is confirmed.

Color slides (35 mm) of the holotype of *Ischnochiton aethalotus* have been deposited in the California Academy of Sciences Department of Invertebrate Zoology Color Slide Series (CASIZ) as Nos. 2185, 2186.

Ischnochiton (Stenoplax) aethonus Dall, 1919

Ischnochiton (Stenoplax) aethonus Dall, 1919:507-508.
Ischnochiton aethonus Dall, 1919. Thorpe (*in* Keen, 1971): 869 (syn. of *Radsiella rugulata* (Sowerby, 1832)).
Stenoplax aethona (Dall, 1919). Keen, 1958:526. Abbott, 1974:397 (syn. of *S. rugulata*).
Stenoplax aethona (Dall, 1919). Keen, 1958:526. Abbott, 1974:397 (syn. of *S. rugulata*).

Syntypes: U.S.N.M. No. 218814.

Type locality: "Near Cape San Lucas, Lower California, in 10 fathoms."

Remarks: This species was collected by the United States Fish Commission Steamer *Albatross*. Dall says it is of the same general type as *Ischnochiton* [= *Stenoplax*] *limaciformis* (Sowerby, 1832) but has a sculpture that is totally different from that or from *Stenoplax fallax* (Carpenter in Pilsbry, 1892). Dimensions, presumably of the larger specimen, are: L., 11; W., 6.5; H., 4 mm.

The syntype series of *Ischnochiton (Stenoplax) aethonus* consists of 2 specimens. The smaller of the 2 is complete with all valves in place in the girdle. The larger one has been partially disarticulated, valves i-iv and vii being in place in the girdle; valves v and vi are together but loose, along with valve viii, which also is separate. The larger of the 2 syntypes is herein designated as the **lectotype** as it shows the characters of the species somewhat better than the smaller, which becomes a **paralectotype**.

The girdle scales of *Stenoplax aethona* are very small, closely-packed, rather thin, longer than wide, and slightly recurved inward. They do not appear striated under fairly high magnification. Dr. S. S. Berry (*in litt.*, 15 October 1959) says the peculiarities of the girdle armature, as described by Dall, ". . . were my major reliance in the separate recognition of *circumsenta* [*Stenoplax circumsenta* Berry, 1956], although there would seem to be sufficient sculptural differences as well".

Along with several other species names, Thorpe (*in* Keen, 1971 and Abbott (1974) treat *Stenoplax aethona* as a synonym of *Radsiella rugulata* (Sowerby, 1832) without supplying any supporting reasons for such an assignment. Neither does Thorpe justify his use of the genus *Radsiella* for this and several other Panamic Province chiton species. Until proven to be correct, such taxonomic treatment is unjustified.

So far as I have been able to determine, no specimens of *Stenoplax aethona* have been collected since the original lot was obtained. Thus, until it is better known and its relationships with other West Coast species of *Stenoplax* are understood better than at present, it seems proper to consider it as a valid species. Color slides of the holotype are deposited as CASIZ Nos. 3311-3315.

Ischnochiton (Ischnochiton) aureotinctus Carpenter in Pilsbry, 1892

Ischnochiton (Ischnochiton) aureotinctus Carpenter MS, Pilsbry, 1892:123. Dall, 1921:191.
Ischnochiton aureotinctus Carpenter in Pilsbry, 1892. Keep, 1904:349. Oldroyd 1927:276-277. Palmer, 1945:101. Burghardt & Burghardt, 1969b:16.
Ischnochiton (Lepidozona) aureotinctus Carpenter in Pilsbry, 1892. Smith, 1947b:18 (listed only). Palmer, 1958:272, plt. 31, figs. 1-4.

Holotype: Redpath Museum, Montreal, Canada, No. 26.

Type locality: "Catalina Is. 80 fm. Cooper, 1071a."

Remarks: The holotype is small, measuring: length, 6.25; width, 4 mm; the angle of divergence of the side-slopes is 100°. All of the valves are present, numbers ii, iii, iv, and v being together in one piece, the other having valves vi and vii together; valves i and viii are separate. Carpenter gives the slit-formula as 11 - 1 - 13 although according to present count the tail valve has only 6 slits, which is a considerable discrepancy.

Carpenter's description of this species is meager. He compares it to *Ischnochiton scabricostatus* (Carpenter, 1864), also dredged off Santa Catalina Island, southern California, in 10-20 fathoms. The background sculpture consists of low, round separated pustules, giving the dorsal valve surfaces a granular appearance in extremely low relief. This sculpture is similar, in general, but is not nearly as strongly developed as it is on *I. newcombi* Carpenter in Pilsbry, 1893. The lateral areas are only barely discernably elevated. The holotype specimen appears to be a juvenile. I have seen no other specimens from the same general locality exactly like it. However, Dr. Ferreira, who has studied the chitons in the Willett Collection recently, which now is at the University of California (Los Angeles), informs me that one of three in Willett Lot No. 2947 from 30 fathoms [55 m] off Santa Catalina Island, may be another specimen of *I. aureotinctus*.

This species cannot be assigned with any assurance to the genus *Lepidozona*. Probably it should remain a *nomen inquirendum* pending the collection and study of more and better material. Color slides of the holotype of *Ischnochiton aureotinctus* are CASIZ Nos. 3081, 3082 (Ferreira) and No. 3088 (AGS).

Ischnochiton berryi Dall, 1919

Ischnochiton berryi Bartsch MS. Berry, 1907:51; *nomen nudum.*
Ischnochiton berryi Dall, 1919:507; 1921:192. Oldroyd, 1927: 279. Burch, 1942:7. Light's Manual (2nd ed.), 1954:218 (listed only). Abbott, 1974:395 (?syn. of *Lepidozona sinudentata* (Carpenter in Pilsbry, 1892)).
Ischnochiton (Lepidozona) berryi Dall, 1919. Smith, 1947b:18 (listed only). Smith & Gordon, 1948:207.
Lepidozona berryi (Dall, 1919). Burghardt & Burghardt, 1969b:20, 44, plt. 2, fig. 32 (in color).

Holotype: U.S.N.M. No. 193375.

Type locality: Pacific Grove, California.

Remarks: The holotype is complete, dried flat with the animal removed. It measures: L., 10.5; W., 6.3; H., 2.7 mm. Dall gives the slit-formula as being *ca.* 12 - 1 - 11. The species is relatively high-arched, reddish in color, and similar in configuration and sculpture as well as color to specimens dredged fairly commonly on the shale bed in Monterey Bay, off Pacific Grove and Del Monte in approximately 10 fathoms [18.3 m]. Dall (1921:192) gives the range as "Monterey to San Pedro, California".

Relationship of *Ischnochiton berryi* to *Lepidozona sinudentata* (Carpenter in Pilsbry, 1892) is very close and for many years I considered it a subtidal zone form of this uncommon low intertidal zone species. It occurs in several color patterns, including the alternating dark and light-banded one that has been called the "*gallina* type" from *Ischnochiton (Lepidozona) gallina* Berry, 1925, from off White's Point, Los Angeles County, California (see Burghardt & Burghardt, 1969b, plt. 2, fig. 30). The Burghardt & Burghardt illustration of the "*berryi* type" (plt. 2, fig. 32) represents a specimen of *L. sinudentata* of the typical whitish color with grayish-green splotches found normally in the low intertidal zone of the Monterey Bay area and not the dredged, higher arched, reddish form typical of *L. berryi*.

I am now convinced that *Ischnochiton berryi* and *I. decipiens* Carpenter in Pilsbry, 1892, are conspecific although this allocation is a subjective one as type material of the latter species apparently does not exist. If this be accepted, it seems logical to indicate both species names as synonyms of *Lepidozona sinudentata* (Carpenter in Pilsbry, 1892), which provides much broader coverage for this species both in bathymetric as well as geographic range than has heretofore been allowed.

Color slides of the holotype of *Ischnochiton berryi* are CASIZ Color Slide Series Nos. 2960, 2961 (AGS) and Nos. 3094, 3095 (Ferreira).

Ischnochiton biarcuatus Dall, 1903

Ischnochiton biarcuatus Dall, 1903b:176. Lowe, 1904:19. Abbott, 1974:397 (syn. of *Stenoplax corrugata* (Carpenter in Pilsbry, 1892)).
Ischnochiton (Stenoplax) biarcuatus Dall, 1903. Dall, 1921: 190. Oldroyd, 1927:271. Smith, 1947b:18 (listed only); 1947c:6.
Stenoplax biarcuatus (Dall, 1903). Burghardt & Burghardt, 1969:35 (syn. of *S. corrugata*).

Holotype: U.S.N.M. No. 109308.

Type locality: "Off Avalon [Santa Catalina Island, California], 50 fms. H. N. Lowe."

Remarks: The holotype measures: L., 18; W., 7 mm. It has been disarticulated; there are several small pieces of what is left of the girdle. Dall says: "The peculiar sculpture of this species separates it from those already described from this region. In a general way it recalls the very young of *I. magdalenensis* Hinds."

From a study of the holotype, my conclusion is that most certainly *Ischnochiton biarcuatus* and *Stenoplax corrugata* (Carpenter in Pilsbry, 1892) are conspecific. A 35 mm color slide of the holotype of *I. biarcuatus* is CASIZ No. 2203 (AGS).

Ischnochiton brunneus Dall, 1919

Ischnochiton brunneus Dall, 1919:504. Oldroyd, 1927:271. Burghardt & Burghardt, 1969b:16 (with syn. *I. bryanti* Dall, 1919). Abbott, 1974:395.
Ischnochiton (Ischnochiton) brunneus Dall, 1919. Dall, 1921: 190. Smith, 1947b:18 (listed only).

Holotype: U.S.N.M. No. 58734a.

Type locality: "San Diego, Cal. H. Hemphill."

Remarks: The holotype is preserved dry with the dried-in animal and is nicely flattened. Measurements are: L., 18; W., 12; H., 3 mm. The anterior end of the girdle is somewhat damaged, and there is a small nick in the posterior end. Without question, it is a subadult of the species described subsequently as *Lepidozona californiensis* (Berry, 1931), which, as will be shown later herein, should be relegated to the synonymy of *Lepidozona pectinulata* (Carpenter in Pilsbry, 1893).

Color slides of the holotype of *Ischnochiton brunneus* are CASIZ Nos. 2972, 2973 (AGS) and Nos. 3107, 3108 (Ferreira).

Ischnochiton bryanti Dall, 1919

Ischnochiton bryanti Dall, 1919:503. Burghardt & Burghardt, 1969b:16 (syn. of *I. brunneus* Dall, 1919). Abbott, 1974:395.
Ischnochiton (Ischnochiton) bryanti Dall, 1919. Dall, 1921: 190. Smith, 1947b:18 (listed only).

Holotype: U.S.N.M. No. 253826.

Type locality: " 'California' F. W. Bryant."

Remarks: The holotype is preserved dry and flat; it has been partly disarticulated, valves i and viii being separate. Measurements are: L., 9; W., 5.5; H., 2 mm. Dall gives the slit-formula as 13 to 14 - 1 - 11. There is little question but that the holotype of *Ischnochiton bryanti*, like *I. brunneus*, preceding, is a subadult of the common intertidal zone southern California species of *Lepidozona*, which I now consider should be identified as *L. pectinulata* (Carpenter in Pilsbry, 1893) with synonyms *Ischnochiton brunneus, I. bryanti*, and *I. (Lepidozona) californiensis* Berry, 1931.

Color slides of the holotype of *Ischnochiton bryanti* are CASIZ Nos. 2965, 2965A (AGS) and No. 3109 (Ferreira).

Ischnochiton (Lepidozona) californiensis Berry, 1931

Ischnochiton (Lepidozona) californiensis Berry, 1931:255-258, plt. 29, figs. 1-2. Smith, 1947b:18 (listed only). Smith & Gordon, 1948:207. Palmer, 1958:272-273, plt. 31, figs. 5, 6.
Ischnochiton californiensis Berry, 1931. Thorpe, 1962:205.
Lepidozona californiensis (Berry, 1931). Smith, 1960:56, fig. 38,8 (Pleistocene). McLean, 1969:64, fig. 35,5. Burghardt & Burghardt, 1969b:20, 43, plt. 2, fig. 26 (in color). Phillips, 1971:22. Abbott, 1974:395.

Types: Holotype in Berry Collection, author's register No. 1699 (Cat. No. 5226). Paratypes in Berry Collection (Cat. No. 3119), San Diego Museum of Natural History, British Museum (Natural History), Academy of Natural Sciences of Philadelphia, Stanford University Department of Geology, and the United States National Museum of Natural History.

Type locality: "Rocky shore near the Scripps Institution of Oceanography, La Jolla, California; between tides; S. S. Berry coll., February-March, 1913."

Remarks: Berry (1931) clears up the confusion that had existed over the specific identity of his southern California form and the common Panamic Province *Lepidozona clathrata* (Reeve, 1847), separating the two on the basis of conchological characters as well as on geographic grounds. Also, he provides a synonymy for *L. californiensis*, which involves three other species names (*pectinatus, pectinulatus,* and *clathratus*) and discusses their taxonomic relationships. Much the same area is covered by Palmer (1958).

The holotype of *Lepidozona californiensis* has not been available for study but a paratype was loaned through the courtesy of the Academy of Natural Sciences of Philadelphia (ANSP No. 161,525). Because this southern California intertidal zone species now is well known, there are no difficulties in identifying it thanks to S. S. Berry's excellent analysis and good illustrations.

My conclusion that *Lepidozona californiensis* should be treated as a synonym of *L. pectinulata* (Carpenter in Pilsbry, 1893) is discussed in the notes on this latter species, herein.

Color slides of the paratype in the Academy of Natural Sciences of Philadelphia (No. 161525) are CASIZ Nos. 2968, 2968A, 2969, and 2969A (AGS).

Ischnochiton (Lepidozona) catalinae Willett, 1941

Ischnochiton (Lepidozona) catalinae Willett, 1941:185-186, plt. 31, fig. 2. SMITH, 1947b:18 (listed only). SMITH & GORDON, 1948:207 (error in identification).

Lepidozona catalinae (Willett, 1941). BURGHARDT & BURGHARDT, 1969b:20-21. ABBOTT, 1974:396.

Types: Holotype in the Los Angeles County Museum of Natural History, No. 1063. Paratypes in the Willett Collection (University of California at Los Angeles), the Academy of Natural Sciences of Philadelphia, and the private collection of A. G. Smith (now California Academy of Sciences Geology Type Collection, No. 10263). There was a total of 12 specimens in the type lot.

Type locality: "Off White's Landing, Catalina Island, in 30 fathoms. Collected by G. Willett."

Remarks: The holotype, which is preserved dry and flat, measures: L., 16.2; W., 9.2; H., 3.2 mm; the slit-formula is 10 - 1 - 10. Willett's comparison of his southern California dredged specimens with the common, more northern, intertidal zone *Lepidozona mertensii* (Middendorff, 1847) is unfortunate as the two species are not closely related except for being in the same genus. *Lepidozona catalinae* is much more closely related to *L. willetti* Berry, 1917, from 15-20 fathoms [27.4-36.6 m] off Forrester Island, southeast Alaska, and possibly to *L. golischi* [= *L. scabricostata* (Carpenter, 1864)] originally from 100 fathoms off Santa Monica, Los Angeles County, California, and more recently from several other deeper-water West Coast localities.

So far as I know, *Lepidozona catalinae* and *L. willetti* are determined with certainty only from their respective type localities. Although Smith & Gordon (1948) reported a single, somewhat damaged specimen of *L. catalinae* from 40 fathoms [73.2 m] in Monterey Bay, a re-examination has proved this to be a misidentification, leaving its true identity problematical. Following an examination and direct comparison of type specimens of *L. willetti* and *L. catalinae,* Dr. Antonio Ferreira concludes they are conspecific. He says (*in litt.,* 29 May 1974): "Seen side by side, the 'virtual paratype' of *L. willetti* and the holotype of *L. catalinae* are identical except for a banded girdle in the latter; even the distinctive color, the Mikado brown, is the same in both". Based on his more intimate recent familiarity with the West Coast Lepidozonas, I believe Dr. Ferreira's taxonomic conclusion is reasonable in this instance and therefore is the correct one to follow in future.

Color slides of the holotype of *Lepidozona catalinae* are CASIZ Nos. 3111-3113 (Ferreira). No. 3113 provides a comparison between the holotype and an authentic specimen of *L. willetti.*

Ischnochiton cooperi acutior
Carpenter in Dall, 1919

Ischnochiton cooperi acutior Carpenter MS, Dall, 1919:508; 1921:192 (in sec. *Lepidozona*). OLDROYD, 1927:282 (in sec. *Lepidozona*); WILLETT, 1935:44; PALMER, 1945:101; 1958:274, plt. 34, figs. 1-6.

Ischnochiton (Ischnochiton) acutior Carpenter in Dall, 1919. DALL, 1921:192 (in sec. *Lepidozona*).

Lepidozona acutior (Carpenter in Dall, 1919). ABBOTT, 1974: 395 (syn. of *L. cooperi* Pilsbry, 1892).

Types: Holotype in U.S.N.M. No. 30734 (marked "type"). Redpath Museum, Montreal, Canada, No. 8 (6 specimens) and No. 18 (5 specimens). The Redpath Museum specimens also are labeled "type" according to Dr. Katherine Palmer (1958).

Type localities: For the U.S.N.M. holotype: "Todos Santos Bay (Hemphill)"; for Redpath Museum No. 8: "Sta. Cruz Cooper False Bay near San Diego collected by Hemphill"; for Redpath Museum No. 18: "Todos Santos Bay collected by Hemphill".

Remarks: As Dr. Palmer has stated, this species (or subspecies) never was adequately described by Dall. Also, the unusual plethora of so-called "types" leaves the true holotype and its type locality in doubt. In order to clarify this situation, I select U.S.N.M. No. 30734 as the **lectotype**, and the type locality as Todos Santos Bay, Lower California. Since this specimen evidently was collected in Todos Santos Bay by Hemphill along with the 5 other specimens in the Redpath Museum (No. 18), these latter are hereby designated **paralectotypes**. The other 6 "types" come from two widely separated localities: Santa Cruz on Monterey Bay, California, collected by Dr. James G. Cooper; and False Bay [= Mission Bay] a short distance north of San Diego, California. I would not therefore rate these **paralectotypes** although they may be of some historical interest.

Many years ago, the late George Willett sent me an excellent black-and-white photograph of the holotype in the U.S. National Museum of Natural History (No. 30734). Subsequently this was borrowed and photographed in color; the slide is deposited as CASIZ No. 2048 (AGS). The specimen is preserved dry and flat; its length is 12.1 mm. Illustrations of it, including the excellent ones provided by Palmer (1958), leave no doubt that *Lepidozona cooperi acutior* merely represents a young phase of *L. cooperi* (Pilsbry, 1892) with the sharp and unworn sculpture that is typical on subadult and also on subtidal zone specimens of the nominate species.

Ischnochiton (Ischnochiton) corrugatus
Carpenter in Pilsbry, 1892

Ischnochiton (Ischnochiton) corrugatus Carpenter MS, Pilsbry, 1892:123-124. Dall, 1921:192.

Ischnochiton corrugatus Carpenter. Keep, 1904:349. Oldroyd, 1927:279. Palmer, 1945:101.

Ischnochiton (Stenoplax) corrugatus Carpenter in Pilsbry, 1892. Smith, 1947b:18 (listed only); 1947c:7-8; Palmer, 1958:271, plt. 29, figs. 5-8.

Stenoplax corrugata (Carpenter in Pilsbry, 1892). Smith, 1963:148; Burghardt & Burghardt, 1969b:35 (with syn. *S. biarcuata* (Dall, 1903)); Abbott, 1974:396-397 (with syn. *Ischnochiton biarcuatus* Dall, 1903).

Holotype: Redpath Museum, No. 37.

Type locality: "Catalina Is. 40 fms. 1070 Cooper no. 1068."

Remarks: Pilsbry (1892) gives the range of *Ischnochiton corrugatus* as: "Catalina Is. beach to 40 fms. (Cooper, Cal State Coll. Nos. 1066, 1070, 1074; Todos Santos Bay (Hemphill), California [sic]." Measurements of a specimen are given as: L., 13.75; W., 7 mm; divergence of side-slopes 90°-100°. Smith (1947c) describes a single specimen dredged by John Q. Burch in 25 fathoms [45.7 m] off Redondo Beach, Los Angeles County, California, and mentions another (1963) dredged in 26 fathoms [47.6 m] off Guadalupe Island, Mexico.

I have not seen the specimens in the U.S. National Museum of Natural History or in the Redpath Museum. The location of Cooper's specimens, originally said to have been in the California State Collection, is not known to me. However, in the California Academy of Sciences Geology Type Collection there is a "metatype", No. 2894, labeled as collected in Todos Santos Bay, Lower California, by Hemphill and identified by P. P. Carpenter. It measures: length, 21.9; width, 8.1 mm. This should be rated as a paratype as there is good reason to believe it is one of those in Hemphill's original lot.

In spite of Carpenter's initial placement of *corrugatus* in the genus *Ischnochiton,* Pilsbry believed it should be treated as a *Stenoplax,* which undoubtedly it is on the basis of valve configuration and sculpture. *Ischnochiton biarcuatus* Dall, 1903, is a synonym of *Stenoplax corrugata,* as indicated earlier herein.

A color slide of the "metatype" in the California Academy of Sciences is CASIZ No. 2667 (AGS). Slides of another specimen from one of the Santa Barbara Channel Islands are Nos. 2554, 2555 (Ferreira).

Ischnochiton (Ischnochiton) decipiens
Carpenter in Pilsbry, 1892

Ischnochiton (Ischnochiton) decipiens Carpenter MS, Pilsbry, 1892:123; 1898a:288 (as *"Ischnochiton (decipiens var.?) sinudentatus* Cpr."). Dall, 1921:192 (in sec. *Lepidozona* Pilsbry, 1892); Oldroyd, 1927:282-283 (in sec. *Lepidozona*); Smith, 1947b:18 (listed only); Smith & Gordon, 1948:207.

Ischnochiton decipiens Carpenter in Pilsbry, 1892. Keep, 1904:349; Willett, 1935:43-44 (with syn. *I. (Lepidozona) gallina* Berry, 1925); Burch, 1942:7; Burch & Burch, 1943a:5; Palmer, 1958:274.

Lepidozona decipiens (Carpenter in Pilsbry, 1892). Burghardt & Burghardt, 1969b:21 (?syn. of *L. sinudentata* (Carpenter in Pilsbry, 1892)); Abbott, 1974:395 (with syn. *L. gallina*).

Holotype: Location unknown; presumably lost.

Type locality: Monterey, California.

Remarks: Carpenter's meager description of this species, as quoted by Pilsbry in the Manual of Conchology (1892), consists of two sentences, as follows:

> "Shell exactly like pectinulatus, but reddish, elevated, the jugum acute; scales of the girdle small, striated.
> "Length, 15, breadth 7½ mill.; divergence 105°. Cpr.).
>
> Monterey, California."

Because the type or other authentic specimens of *I. decipiens* have not turned up, the species never has been illustrated. Although the name *decipiens* has been used on labels for specimens of the subtidal zone southern California chiton of the *listrum-gallina* type of sculpture by Willett, J. Q. Burch, and others, such usage has no authoritative basis. Pilsbry (1898) mentions "*Ischnochiton* (*decipiens* var.?) *sinudentatus* Cpr." collected (probably dredged) by Dr. Harold Heath at Pacific Grove, California.

I am convinced that what Carpenter called *Ischnochiton decipiens* is the same as *I. berryi* Dall, 1919, and thus is an earlier name for the Dall species. The reasons for this conclusion are these:

(a) The phrase "exactly like pectinulatus", plus the small, striated scales of the girdle, point to the genus *Lepidozona* as now understood, and to a chiton species close to or equivalent with *Ischnochiton sinudentatus* Carpenter in Pilsbry, 1892.

(b) The phrase "reddish, elevated, the jugum acute" points to *I. berryi* Dall, 1919. This is supported further by the size of *I. berryi* (about 15 mm in length), the 105° divergence, and especially the type locality, Monterey Bay, which is the same as for *I. berryi*.

In the collection of the Academy of Sciences of Philadelphia, there is a series of 6 small chitons (the largest partially disarticulated) with the label: "*I. decipiens sinudentatus* Cpr / Pacific Grove, nr. Monterey, Cal. / H. Heath; Aug. 1." The depth is indicated as 12 fathoms [22 m]. These specimens borrowed by Dr. Ferreira, October, 1974, in connection with his study of the genus *Lepidozona* in the Panamic Province (Ferreira, 1974). All of them represent the subtidal zone form of *Lepidozona* that has been dredged fairly commonly on the shale bed in about 10 fathoms off Pacific Grove and Del Monte in Monterey Bay that Dall described as *Ischnochiton berryi*. Pilsbry's (1898) citation, based on Heath's specimens in the Philadelphia Academy, is of interest to the extent that he infers he was uncertain as to just what Carpenter's *I. decipiens* was as far back as 1898 although he did definitely relate it to *Lepidozona sinudentata*.

Based on the above, I recommend *Ischnochiton berryi* Dall, 1919, be placed in the synonymy of *I. decipiens* Carpenter in Pilsbry, 1892, which at least reduces the number of names in the so-called *sinudentatus* group by one, leaving the taxonomic relationship between *I. decipiens* and *Lepidozona sinudentata* (Carpenter in Pilsbry, 1892) for a separate determination that already has been covered to some extent in the discussion, herein, of *Ischnochiton berryi*.

Chiton dentiens Gould, 1846

Chiton dentiens Gould, 1846:125; 1862:6. Carpenter, 1857a: 209, 318; 1864b:606, and 1872 reprint:92 (= *Ischnochiton pseudodentiens*); Berry, 1948:13; Johnson, 1964:67.

Chiton (Onithochiton) dentiens Gould, 1846. Gould, 1852: 321m figs. 433a-b; 1862:242; Johnson, 1964:67.

Ischnochiton pseudodentiens Carpenter, 1864b:606 and 1872 reprint:92 (syn. of *C. dentiens*).

Ischnochiton (Trachydermon) pseudodentiens Carpenter, 1864. Carpenter, 1864b:612, and 1872 reprint:98 *nomen nudum; ibid*:649, and 1872 reprint:135 "= type specimen of *dentiens*"; 1865:60.

Trachydermon pseudodentiens (Carpenter, 1864). Cooper, 1867:22.

Chiton (Trachydermon) dentiens Gould, 1846. Orcutt, 1885: 544.

Ischnochiton (Trachydermon) dentiens (Gould, 1846). Carpenter, 1864b:649, and 1872 reprint:135. Pilsbry, 1892: 73-74, plt. 8, figs. 61-65.

Ischnochiton dentiens (Gould, 1846). Packard, 1918:292-293.

Trachydermon dentiens (Gould, 1846). Cooper, 1867:22; Dall, 1879:323: Pilsbry, 1894:65, plt. 15, fig. 26 (girdle scales, × 250); 1898b:51 (Socorro Island). Taylor, 1895: 94; Bradshaw, 1898:9; Thiele, 1909:17; T. S. Oldroyd, 1911:74; Chase, 1917:30. (= *Mopalia acuta, fide* Berry, 1922:403); Dall, 1918:1.

Trachydermon (Cyanoplax) dentiens (Gould, 1846). Berry, 1948:14 (with *T.* (*C.*) *raymondi* Pilsbry, 1894, as a syn.).

Lepidochitona dentiens (Gould, 1846). Dall, 1918:3; 1921: 188; Berry, 1922:410, 415, 438, 439, table 1, plt. 1, figs. 7-9 (Pleistocene). Oldroyd, 1924:186; 1927:259-260; Smith, 1947a:8-9; 1947b:16 (listed only); Berry, 1948: 13; Abbott, 1974:397.

Trachydermon (Cyanoplax) raymondi Pilsbry, 1894a:46-47; 1898a:287. Taylor, 1895:95 (footnote); 1899-250; Newcombe, 1896:19; Berry, 1948:13-14 (syn. of *T.* (*C.*) *dentiens*).

Trachydermon raymondi Pilsbry, 1894. Pilsbry, 1894b:57; Heath, 1904:257, fig. A; 1905:391-392; Keep, 1904:348; F. Baker, 1910:15; Higley & Heath, 1912:95-97, figs. 1A-C.; Packard, 1918;295-296; Hoffman, 1929:362; Smith, 1966:434 (syn. of *Cyanoplax dentiens*).

Lepidochitona raymondi (Pilsbry, 1894). Dall, 1921:189; Oldroyd, 1924:188; 1927:262-263; Chase & Chase, 1933: 123; Willett, 1935:43; Light's Manual (1st ed.), 1941: 129, 130, fig. 111.

Lepidochitona (Trachydermon) raymondi (Pilsbry, 1894). Johnson & Snook, 1927 (1967): 561-562, fig. 661.

Lepidochiton raymondi (Pilsbry, 1894). La Rocque, 1953:9.

Cyanoplax raymondi (Pilsbry, 1894). Thiele, 1909:17. Berry, 1917:231, 234; 1927:160; Willett, 1919:27; Smith, 1947a:14-15; 1947b:18 (listed only); Smith & Gordon, 1948:206; Berry, 1948:14; Light's Manual (2nd ed.), 1954:218; Thorpe, 1962:207; Abbott, 1974: 398; Light's Manual (3rd ed.), 1975:464 (syn. of *C. dentiens*).

Cyanoplax dentiens (Gould, 1846). Berry, 1948:13-15 (*C. raymondi* made a syn.); 1951:214-219 (with syn. *C. raymondi*); Light's Manual (2nd ed.), 1954:218, fig. 98d;

Palmer, 1958:265, Smith, 1966:434, 442; Ricketts & Calvin (4th ed.), 1968:272, 505; Burghardt & Burghardt, 1969a:228; 1969b:13, 43, plt. 1, fig. 11 (in color) (with syn. *C. raymondi*); Kues, 1974:297 (with *C. d. cryptica* n. ssp.); Light's Manual (3rd ed.), 1975:462, 464, plt. 109, fig. 7 (with syn. *C. raymondi*); Gomez, 1975:28, 29; Robb, 1975:36.

Holotype: U.S.N.M. No. 5824.

Type locality: Puget Sound, Washington (United States Exploring Expedition).

Remarks: S. S. Berry cleared up the confusion relating to this species in 1948 after studying the holotype and synonymized *Trachydermon (Cyanoplax) raymondi* Pilsbry, 1894, under it. He also established the occurrence of a similarly appearing but different species that is relatively common in the intertidal zone along the southern California coast, *Lepidochitona keepiana* Berry, 1948.

The holotype of *Cyanoplax dentiens* was borrowed for study in 1970. The museum label reads: "*Chiton* [= *Cyanoplax*] *dentiens* Gld. = *Chaetopleura pseudodentiens* Cpr. / Oregon / U.S.E.E." It is curled, the length in this condition being 4.7 mm. It has been partly disarticulated, valves i, ii, and iii being separate. Color slides of the curled animal and the three separate valves are CASIZ Nos. 2241, 2242 (AGS).

Ischnochiton eucosmius Dall, 1919

Ischnochiton eucosmius Dall, 1919:509. DuShane & Poorman, 1967:438; Thorpe (*in* Keen, 1971:868 (syn. of *Radsiella guatemalensis* (Thiele, 1910)).

Ischnochiton (Ischnochiton) eucosmius Dall, 1919. Keen, 1958:520, fig. 14.

Syntypes: U.S.N.M. No. 218194.

Type locality: "Magdalena Bay, Lower California, C. R. Orcutt."

Remarks: There are two syntypes in the type lot, both preserved dry, entire, and fairly flat. One measures 10.4 mm in length; the other, 9.8 mm. Dall's measurements are: L., 10; W., 5.5; H., 3.3 mm. The larger of the two syntypes is herein designated as the **lectotype** and the slightly smaller one as **paralectotype**.

Ischnochiton eucosmius is a small, little-known species that seems to be uncommon. It is, however, a perfectly distinct species unrelated to other Ischnochitons from the Gulf of California. Thorpe's placement of it as a synonym of *Radsiella guatemalensis* (in Keen, 1971) lacks supporting evidence; and his use of the genus *Radsiella* is open to question on taxonomic grounds.

A color slide of the 2 syntype specimens of *Ischnochiton eucosmius* is CASIZ No. 2154 (AGS). Additional slides of specimens from Costa Rica are CASIZ Nos. 2772-2774 (Ferreira).

Ischnochiton exanthematus Dall, 1919

Ischnochiton exanthematus Dall, 1919:505.

Holotype: U.S.N.M. No. 96226.

Type locality: Straits of Magellan in 61 fathoms, sand, bottom temperature 48°, United States Fish Commission steamer *Albatross*."

Remarks: The holotype is preserved dry with the animal intact; it is somewhat curled. No other specimens were collected. As already shown, *Ischnochiton exanthematus* and *I. acelidotus* Dall, 1919, are conspecific; and I have already designated the former as a synonym of the latter regardless of the fact that it has page priority.

Color slides of the type of *I. exanthematus* are CASIZ Nos. 3145-3149 (AGS); 3264-3265 (Ferreira).

Ischnochiton (Lepidozona) gallina Berry, 1925

Ischnochiton (Lepidozona) gallina Berry, 1925:228-229, plt. 11, figs. 1, 2. Smith, 1947b:18 (listed only). Smith & Gordon, 1948:207, 208 (in error as *I.* (*L.*) *golischi* Berry, 1919).

Ischnochiton gallina Berry, 1925. Willett, 1935:43-44 (syn. of *I. decipiens* Carpenter, 1892). T. A. Burch, 1942:7.

Lepidozona gallina (Berry, 1925). Burghardt & Burghardt, 1969b:23 (syn. of *L. sinudentata* (Carpenter in Pilsbry, 1892)); Abbott, 1974:395, fig. 4643 (2 views, after Berry, 1925) (syn. of *L. decipiens* (Carpenter in Pilsbry, 1892)).

Holotype: "A shell preserved dry [S.S.B. 757] entered as Cat. No. 4898 of the author's collection (*ex* No. 1179, collection of R. H. Tremper)."

Type locality: Off White's Point, Los Angeles County, California.

Remarks: The species is based only on the holotype. Berry has pointed out that in sculpture his species was fairly close to *Ischnochiton berryi* Dall, 1919, and to *I. sinudentatus* Carpenter in Pilsbry, 1892, but was remarkable in its color pattern. Willett (1935) says: "Examination of the sculpture of valves and mantle of *gallina* and *decipiens* shows them to be identical in this regard and it appears conclusive that *gallina* must be considered only a color form of *decipiens,* probably without any ecological significance." Smith & Gordon (1948) came to his same conclusion although the comparison was made with *Ischnochiton sinudentatus* and *I. berryi* on the basis of Monterey Bay specimens. This was clouded by the fact that their conclusion was covered under their discussion of *Ischnochiton (Lepidozona) golischi* Berry, 1919, this being an unfortunate error for *I. (L.) gallina* Berry as originally intended. References to *"golischi"* (Smith & Gordon, 1948, pp. 207, 208) should in each instance be corrected to read *"gallina"*. Burghardt & Burghardt (1969b) treat *Lepidozona gallina* as a synonym of *L. sinudentata* Carpenter in Pilsbry, 1892, which now reflects its correct taxonomic status.

Because Berry's illustrations of *Ischnochiton (Lepidozona) gallina* show its sculptural characters so beautifully, it was not believed necessary to borrow the holotype for a further study. Berry's fig. 2, on pl. 11, of his paper is by far the best illustration published so far of the type of sculpture occurring on the common subtidal zone southern California *Lepidozona* currently masquerading under several incorrect names. The *"gallina"* situation is an excellent example of the need to look beyond the color pattern and concentrate on the sculpture. Berry's illustrations are reproduced in Abbott (1974, figs. 4643).

Ischnochiton (Lepidozona) golischi Berry, 1919

Ischnochiton (Lepidozona) golischi Berry, 1919a:7 [= 47]; 1925:229-231, plt. 11, figs. 3, 4. Smith, 1947b:18 (listed only); Smith & Gordon, 1948:207, 208 (in error for *I. (L.) gallina* Berry, 1925).

Ischnochiton (Ischnochiton) golischi Berry, 1919. Dall:1921: 192 (in sec. *Lepidozona* Pilsbry, 1892).

Ischnochiton golischi Berry, 1919. Oldroyd, 1927:284 (in sec. *Lepidozona*); Talmadge, 1973:232.

Lepidozona golischi (Berry, 1919). Burghardt & Burghardt, 1969b:21-22; Abbott, 1974:396, fig. 4647 (2 views, after Berry, 1925).

Holotype: "An animal preserved dry [S.S.B. 1068], entered as Cat. No. 4093 of the author's collection."

Paratype: ". . . [S.S.B. 1067] is the property of the Southwest Museum, Los Angeles."

Type locality: "On stems of coral taken in 100 fathoms, off Santa Monica, California; W. H. Golisch, summer of 1918; one specimen. Paratype from coral taken in 'deep water' in the same region; W. H. Golisch, fall of 1917."

Remarks: As with *Ischnochiton (Lepidozona) gallina,* preceding, described by Berry at the same time, *I. (L.) golischi* is well defined and the illustrations of the holotype are excellent. Specimens usually come from depths of 100 fathoms [183 m] or more and have been dredged at several localities along the West Coast. The most northerly record known to me is in 119 fathoms [218 m] off Edith Point, Mayne Island, in the Strait of Georgia, British Columbia, Canada (I. McT. Cowan Colln., 1963). The species is rare in collections because of the depth of water in which it lives.

Berry's statement regarding the relationship of *Ischnochiton golischi* was prophetic when he said that: "Carpenter's *scabricostatus* would probably be as easy to confuse with it as any . . ." A study of the holotype of *Lepidozona scabricostata* (Carpenter, 1864), and comparison with available specimens of *I. golischi,* indicate that these two species undoubtedly are conspecific, Carpenter's name having priority. This relationship is covered in more detail in the discussion of *Ischnochiton scabricostata* under remarks on that species.

Because Berry's description of the species is completely adequate and his illustrations (repeated in Abbott, 1974) are diagnostic, no attempt has been made to borrow and photograph the holotype or paratype. His statement of the differences between *I. golischi* and *I. scabricostatus,* including "the more sparse ribbing of the central areas, the more numerous and weaker ribs of the lateral areas, the sparse but sharper granular pustulations, and the more rosy coloring" all appear to be within the limits of sculptural variation that might be expected to occur between individual specimens. Although not of type material, the CASIZ Color Slide Series contain slides of other specimens of *L. golischi,* Nos. 590 (AGS) and 3100, 3114 (Ferreira).

Chiton interstinctus Gould, 1846

Chiton interstinctus Gould, 1846:145; 1852:282, plt. 27, figs. 423a-b.

Callochiton interstinctus (Gould, 1846). H. & A. Adams, 1854, 1:471; Carpenter, 1857a:317.

Chiton (Leptochiton) interstinctus (Gould, 1846). Gould, 1862:230, 242; Johnson, 1964:93.

Ischnochiton (Trachydermon) interstinctus (Gould, 1846). Carpenter, 1864b.

Trachydermon interstinctus (Gould, 1846). Cooper, 1867:22; 1870:59.

Ischnochiton interstinctus (Gould, 1846). Dall, 1879:296, plt. 2, fig. 16 (radula teeth); *ibid.*:331. Whiteaves, 1887: 126; Taylor, 1893:102; Newcombe, 1896:19. Keep, 1904:348; Lowe, 1904:19; Thiele, 1909:80, plt. 7, fig. 63; Baker, 1910:45; Berry, 1917:230, 231, 235; 1927:164; Willett, 1919:27; Oldroyd, 1924:191; 1927:275; LaRocque, 1953:13; Burghardt & Burghardt, 1969b:16-17,

plt. 1, figs. 17-19 (in color) (with syn. *I. radians* Carpenter in Pilsbry, 1892); Abbott, 1974:395; Light's Manual (3rd ed.), 1975:465 (?syn. *I. radians*).
Ischnochiton (Ischnochiton) interstinctus (Gould, 1846). Pilsbry, 1892:119-120, plt. 11, figs. 40, 41; plt. 21, fig. 39; Dall, 1921:191; Smith, 1947b:18 (listed only); Smith & Gordon, 1948:207.

Holotype: U.S.N.M. No. 5814.

Type locality: "Oregon".

Remarks: The holotype of *Ischnochiton interstinctus* is in quite good condition. It consists of a dry-preserved, somewhat curled specimen with valves iii - viii in place in the girdle; the head valve is separate and complete; valve ii is broken into 2 pieces, which show the configuration of the sutural laminae. The color is the typical over-all red-brown occurring on specimens from the Pacific Northwest, especially from the Puget Sound area, Washington.

The close relationship between this species and *Ischnochiton radians* Carpenter in Pilsbry, 1892, has been known for a long time. As early as 1917, Berry pointed out that *I. interstinctus* and *I. radians* were "closely related and although most lots may be readily separated by their relative size and color, some of the specimens are sufficiently intermediate so that with occasional undissected shells I have had to fall back upon the blue-green interior usually possessed by *radians* and similar trifling features to separate them". This relationship will be covered more fully in the remarks under *I. radians*.

A 35 mm color slide of the holotype of *Ischnochiton interstinctus* is CASIZ No. 2046 (AGS).

Ischnochiton listrum Dall, 1919

Ischnochiton listrum Dall, 1919:504; Oldroyd, 1927:271-272; Burghardt & Burghardt, 1969b:17; Abbott, 1974:395.
Ischnochiton (Ischnochiton) listrum Dall, 1919. Dall, 1921: 190.
Ischnochiton (Lepidozona) listrum Dall, 1919. Smith, 1947b: 18 (listed only).

Holotype: U.S.N.M. No. 58734.

Type locality: San Diego, California (Hemphill).

Remarks: The holotype was borrowed in June 1974. It is a complete specimen, preserved dry with the animal intact and nicely flattened. It measures: L., 12.1; W., 7.4; and H., 2.5 mm. Dall gives the slit-formula as 12 - 1 - 11.

Ischnochiton listrum is a *Lepidozona* related to and without doubt conspecific with *L. sinudentata* (Carpenter in Pilsbry, 1892). It is only a color phase of the relatively common *Lepidozona* dredged in 20-25 fathoms [66-82 m] off Redondo Beach, Santa Catalina Island, and other areas off southern California by Tom and John Q. Burch, George Willett, and by Ritter and Raymond in 1901 dredging under the auspices of the San Diego Marine Biological Association, a predecessor of the Scripps Institution of Oceanography. It should be indicated, therefore, as a synonym of *Lepidozona sinudentata*.

Color slides of the holotype of *I. listrum* are CASIZ Nos. 2562 (AGS) and 3117, 3118 (Ferreira).

Ischnochiton mariposa Dall, 1919

Ischnochiton mariposa Dall, 1919:506-507. Thorpe (*in* Keen, 1971):869 (syn. of *Radsiella petaloides* (Gould, 1846)); Lindsay, 1966:348.
Stenoplax mariposa (Dall, 1919). Keen, 1958:46, figs. 46a-i (with syn. *S. histrio* Berry, 1945); McLean, 1961:473; DuShane & Poorman, 1967:438; Abbott, 1974:397 (syn. of *S. petaloides* (Gould, 1846)).
Stenoplax histrio Berry 1945:493-495, figs. 10-18. Thorpe (*in* Keen, 1971):869 (syn. of *Radsiella petaloides* (Gould, 1846)); Abbott, 1974:397 (syn. of *S. petaloides*).

Syntypes: U.S.N.M. No. 58865 (3 specimens).

Type locality: "Gulf of California, W. J. Fisher."

Remarks: The type lot, consisting of 3 specimens, was collected by W. J. Fisher in 1876. Bartsch gave it a manuscript name, which was validated by Dall in 1919. It was borrowed in July 1975 by Dr. A. J. Ferreira for study and comparison with collected material and especially with the type of *Chiton petaloides* Gould, 1846, as these two species have been stated to be conspecific. One of the syntypes has been completely disarticulated, with all valves separated from the dried girdle; the other 2 are a juvenile preserved entire, and an adult with a missing head valve. According to one of the type labels, 3 accession numbers are involved: No. 58658b from Las Animas Bay; No. 58865 from "West Coast"; and No. 58880f from Las Animas Bay. Thus it seems proper to select Las Animas Bay as the type locality for *I. mariposa*. As the syntype specimens themselves are not localized on separate labels, I am not designating a lectotype in this instance since there is no way to fix on its locality.

Ischnochiton mariposa is well named. It is one of the most beautiful of the smaller Gulf of California species, with a fantastic variation of color patterns, the normal one having a pearl-gray background with blackish flammulations accompanied by spots or splotches of crimson and ultramarine blue. Unicolored specimens may be almost entirely black, light red-brown, over-all grass green, or pure white. A rare color pattern consisting of alternating dark-brown and light cream colored "zebra striping", similar to that described for *Ischnochiton (Lepidozona) gallina* Berry, 1925.

There is adequate reason for synonymizing *Stenoplax histrio* Berry, 1945, under *Ischnochiton mariposa* Dall, 1919. Although I have not studied the holotype of *S. histrio,* I am relying on the statement in Dr. Berry's 1947 manuscript notes to the effect that the two unquestionably are conspecific. The case for making *Ischnochiton mariposa* a synonym of *I. petaloides* (Gould, 1846), a Hawaiian species, as indicated by THORPE (*in* KEEN, 1971) and ABBOTT (1974) has not rested on sound grounds until now. Loan of the type specimens of both species by the U.S. National Museum of Natural History through the courtesy of Dr. Joseph Rosewater, and a study of 100 specimens of *I. petaloides* in alcohol from the Island of Oahu, Hawaii, collected by Mrs. Harold (Kay) Gudnason of Moraga, California, in 1973-74, now makes it possible to resolve it. The minor differences in the dorsal sculpture between the two species, based only on a comparison of the type specimens, might easily lead one to keep the two separate, especially on zoogeographic considerations. Now that it is possible to compare a considerable number of specimens of each species that is more than adequate in determining the range of individual variation for both, there seem to be no valid reasons why the synonymizing of *I. mariposa* under *I. petaloides* is not the correct taxonomic step to take.

Ischnochiton mariposa, as now identified, is a fairly common, low intertidal to subtidal zone species found mostly in the Gulf of California where it ranges from Puerto Peñasco, Sonora, Mexico, to Cabo Pulmo, Baja California (Sur) at the tip of the peninsula. Dr. Antonio Ferreira (*in litt.,* 2 Nov. 1974) reports a single, typical specimen, which he collected at Masachapa, Nicaragua, although none was found in collections he made in Guatemala, El Salvador, or Costa Rica. It has not been reported from Panama thus far. Based on an analysis of more than 200 specimens from 30 different localities, Dr. Ferreira concludes that there is considerable individual variation in the "wrinkling" of the dorsal sculpture, especially on the lateral areas, which are only weakly developed, normally. The amount of variation that does occur seems to be a function of age, very young and juvenile specimens tending to be less strongly sculptured and hence appearing to be smoother. Dr. Ferreira reports also that the girdle scales of *I. mariposa,* which are relatively large for the size of the animal (a character indicated by Gould as applying to *I. petaloides*), show about 30 minute, closely-spaced, transverse striations in which there is some individual variation under a magnification of × 250. The scales are oval, flattish, and measure about 150 μm in length.

There has evidently been some question whether the genus *Ischnochiton* or the genus *Stenoplax* should be applied to *mariposa.* Recent authorities have used the genus *Stenoplax,* presumably on the basis of valve configuration. My own conclusion is to follow Dall and Pilsbry in the use of the genus *Ischnochiton (sensu lato)* for both *mariposa* and *petaloides,* following the reasoning that on the one hand, both species are much smaller than any other West American or Caribbean *Stenoplax;* and on the other, the girdle scales are typically Ischnochitonoid, of a type found normally on species of *Ischnochiton (Ischnochiton)* and *Lepidozona* rather than on the peculiar elongated and incurved girdle scales in a number of *Stenoplax* species.

Color slides of the syntypes of *Ischnochiton mariposa* are CASIZ Nos. 3175 (Ferreira) and 3271, 3272 (AGS). Slides of other specimens showing color variation are CASIZ Nos. 623, 1385 (green), 2273 (zebra-striped), and 2319 (3 variants) (AGS).

Ischnochiton (Ischnochiton) newcombi
Carpenter in Pilsbry, 1892

Ischnochiton (Ischnochiton) newcombi Carpenter MS, Pilsbry, 1892:120. DALL, 1921:191; SMITH, 1947b:18 (listed only).

Ischnochiton newcombi Carpenter in Pilsbry, 1892. KEEP, 1904:348; OLDROYD, 1927:278; PALMER, 1945:101; 1958: 269, plt. 30, figs. 1-5; BURGHARDT & BURGHARDT, 1969b:17. ABBOTT, 1974:395.

Holotype: Redpath Museum, Montreal, Canada, No. 19.

Type locality: "Catalina Island. Newcomb."

Remarks: The holotype is incomplete. The dried specimen consists of the nearly complete girdle with most of the overlapping girdle scales intact and with valves ii-vi in place. Valves i, vii, and viii are loose and broken into 6 small but identifiable pieces. Pilsbry, quoting Carpenter's MS, gives the measurements as: L., 8¾; W., 6¼ mm; divergence of the sideslopes, 100°.

The description quoted in PILSBRY (1892) is fairly complete. The granules making up the dorsal sculpture are round, regularly-spaced, and well developed as in some species of *Leptochiton.* Although Carpenter says they are arranged in quincunx, to my eye under fairly high magnification they seem to be arranged in evenly-spaced, longitudinal, straight lines except toward the jugum where the lines become somewhat oblique. Except for this small change in granular sculpture, the valves have no well-marked jugal areas. It is not possible to verify the slit formula, indicated by Carpenter to be 12 - 1 - 11.

Ischnochiton newcombi is not like any other Ischnochitons I have seen either from southern California or from the Gulf of California. I believe it to be a valid species, which must be rare as it has not been reported since Newcomb collected it.

Color slides of the holotype of *I. newcombi* are CASIZ Nos. 3083-3085 (Ferreira) and 3089-3091 (AGS).

Redpath Museum No. 19 includes a second small chiton, which PALMER (1958) identified as "a worn *Chaetopleura gemma* . . . ". Dr. Ferreira re-identifies this correctly as a juvenile specimen of *Lepidozona golischi* (Berry, 1919) [= *L.*] *scabricostata* (Carpenter, 1864). This is a more logical assignment, considering its locality.

Ischnochiton ophioderma Dall, 1908

Ischnochiton ophioderma Dall, 1908:356; 1919:506. F. BAKER, 1937:86; THORPE (*in* KEEN, 1971):868 (syn. of *Radsiella dispar* (Sowerby, 1832)).

Ischnochiton (Ischnochiton) ophioderma Dall, 1908. KEEN, 1958:521.

Syntypes: U.S.N.M. No. 110764 (2 specimens).

Type locality: "On the shore at Perico Island, Panama Bay."

Remarks: DALL (1919) re-described *Ischnochiton ophioderma* Dall, 1908, as pointed out by Dr. Fred Baker, who wrote to him about it and obtained a reply that the second description under the name *ophioderma* was, in fact, based on the same ~~specimen~~ species described earlier.

U.S.N.M. No. 110764 consists of two syntypes. The larger is badly curled with some of the valves broken; only valves iii, iv, v, and vi are intact in the girdle, which retains its scales. The smaller specimen is complete, is only slightly curled, and measures 6.3 mm in length. It is herein designated as the **lectotype** of *Ischnochiton ophioderma,* the second specimen becoming a **paralectotype.**

Study of the syntype series of *Ischnochiton ophioderma* and comparison of them with a number of specimens collected in the Panamic Province proves this species to be the same as *I. dispar* (Sowerby, 1832), as already indicated without supporting evidence by THORPE (*in* KEEN, 1971). Therefore it becomes a synonym of the prior-described species.

A color slide of the smaller syntype (the lectotype) is deposited as CASIZ No. 2187.

Lepidopleurus pectinulatus Carpenter in Pilsbry, 1893

Ischnochiton (Lepidopleurus) pectinatus Carpenter, 1864b: 612, and reprint 1872:98, *nomen nudum; ibid.*:649, and reprint 1872:135; 1866:211-212.

Not *Lepidopleurus pectinatus* Carpenter, 1864, *l. c.* = *Ischnochiton cooperi* Carpenter MS, nor *Chiton pectinatus* Sowerby, 1840 (*fide* PILSBRY, 1893:129).

Lepidopleurus pectinatus (Carpenter, 1864). COOPER:1867: 22; 1870:59.

Ischnoplax pectinatus (Carpenter, 1864). KEEP, 1887 (and 1888, 1891, and 1893 reprinting):112.

Lepidopleurus pectinulatus Carpenter MS, "and of American collectors and writers". PILSBRY, 1893:129 (syn. of *Ischnochiton clathratus* (Reeve, 1847), in part).

"Chiton (Lepidopleurus?) pectinulatus Carpenter". DALL, *in* ORCUTT, 1885:544, *nomen nudum.*

Ischnochiton (Lepidozona) pectinulatus Carpenter in Pilsbry, 1893. BERRY, 1922:471-472, plt. 10, figs. 4-6.

Ischnochiton pectinulatus Carpenter in Pilsbry, 1893. BERRY, 1922:412, 414, 421, and table 1 (listed, Pleistocene).

"Ischnochiton punctulatissimus Carpenter". LOWE, 1904:19 (? error for *I. pectinulatus*).

Ischnochiton clathratus (Reeve, 1847) [in part, based on California specimens]. KEEP, 1904:349; BERRY, 1907:51; CHASE, 1917:30 (Pliocene or Pleistocene) = *I. (Lepidozona) sanctaemonicae* Berry, 1922 (*fide* BERRY, 1922:471, footnote); OLDROYD, 1924:193; 1927:282 (in sec. *Lepidozona* Pilsbry, 1892); LELOUP, 1940:3, 15-18, figs. 38-41.

Ischnochiton (Ischnochiton) clathratus (Reeve, 1847). DALL, 1921:192 (in sec. *Lepidozona*).

Lepidozona pectinulata (Carpenter in Pilsbry, 1893). FERREIRA, 1974:165.

Types: See discussion, following.

Type locality: See discussion, following.

Remarks: Because of the difficulties surrounding the taxonomic status of *Lepidopleurus pectinulatus* Carpenter in Pilsbry, 1893, its synonymy is given as completely as possible, above. Carpenter's initial use of the genus name in MS for this species is not that of LEACH *in* RISSO, 1826, as pointed out by DALL (1879) and later by PILSBRY (1893) and therefore is untenable. Pilsbry, no doubt unwittingly, confused the issue by assigning the Carpenter name to the synonymy of *Chiton clathratus* Reeve, 1847. [A minor problem relating to the correct date for *pectinulatus* occurs as a result of the fact that Pilsbry's treatment of *clathratus* in the Manual of Conchology involves two dates; his description of this species on page 128 was published November 25, 1892, although his synonymy for it on page 129 (which includes the reference to *Lepidopleurus pectinulatus* for the first time) was published February 25, 1893.]

BERRY (1931) was instrumental in clearing the way somewhat when he demonstrated that there were two distinct populations of related, intertidal zone, West Coast Lepidozonas, one along the coast of southern California (*L. californiensis*, n. sp.), and a second (*L. clathrata* (Reeve, 1847)) in the Gulf of California. Subsequently, Dall confused the situation further by describing *Ischnochiton bryanti* and *I. brunneus*, both in 1919, which have been determined earlier, herein, to be the same as the one described from southern California. The next taxonomic treatment is by PALMER (1958), who covers the situation partially under "Cf. *Ischnochiton (Lepidozona) californiensis* Berry / *I. pectinatus* Carpenter". Finally, FERREIRA (1974) reviewed the taxonomic tangle surrounding the two separate southern California and Gulf of California species, the former for more than 40 years continuing under the name *Lepidozona californiensis* (Berry, 1931). He concludes that it is proper, considering all the circumstances, to reinstate Carpenter's MS name *pectinulatus*, as validated by PILSBRY (1893) for the southern California *Lepidozona*. This is a view with which I am in agreement. Also, this step serves to reduce the number of published names from four to a single one by relegating three to synonymy. Thus the synonymies of *I. bryanti*, *I. brunneus*, and *L. californiensis*, which already have been covered, should be added to the above synonymy of *Lepidozona pectinulata* (Carpenter in Pilsbry, 1893).

So far as I know, there are no specimens in any museum with a Carpenter label, which he indicated in 1864 were collected on "Cat. Is., beach" or "Bch, Cp." (the "Cp." in this instance undoubtedly standing for the collector, Dr. James G. Cooper, who supplied Carpenter with many West Coast mollusks). Thus apparently there are no validated type specimens to go with the name *pectinulatus*. However, in the type collection of the Academy of Natural Sciences of Philadelphia there are two lots of West Coast chitons associated with the name *pectinulatus*. One, ANSP No. 118664, consists of a series of 13 specimens, now loose but originally glued to a cardboard label, which reads: "*I. clathratus* Rve. / San Diego / Cal. / H. Hemphill." The name "*clathratus*" has been crossed out in pencil and the words "*I. pectinulatus* Cpr. / type. figs. 31-33" added in ink lettering in what I take to be Pilsbry's handwriting. The original label is one of Henry Hemphill's heavy, black-bordered ones (2⅞ ins. x 5⅞ ins.) now cut into 3 pieces. The large cardboard label is accompanied by two other different Hemphill labels, one a border-lined smaller label with the handwritten identification "*Lepidopleurus pectinulatus* Cpr. / San Diego Cal." and "Collected by Henry Hemphill" printed in italics below. The other is a standard Hemphill printed exchange label reading "*Lepidopleurus pectinulatus* Cpr." and carries a pencilled number "547", possibly an early Hemphill field or accession number. The 13 specimens (one of which now is disarticulated) range in length from 17.5-29.5 mm. It was an easy matter to replace them in their original positions on the heavy cardboard label, as indicated by the dust-free oval spots, for a 25 mm color slide, which is CASIZ No. 2971.

The reference to "... type. figs. 31-33" is in the Manual of Conchology, (1), 1892, 14:128, plt. 26, figs. 31-34. Figures 31-33 reproduce Pilsbry's drawings of an intermediate valve (ventral and dorsal) and an enlarged sketch of the girdle scales (fig. 33); fig. 34 reproduces a drawing of a whole animal by Emerton.

The second lot in the Philadelphia Academy type collection, ANSP No. 118662, also has a bearing on the problem under discussion. It consists of 2 dried specimens with the animals removed, preserved fairly flat, originally glued to a black-bordered card. The label reads: "*L. pectinulatus*, Cpr. / = *I. clathratus* Rv. / Monterey / Cal. / R:E.C. Stearns." As in lot ANSP No. 118664, the name "*I. clathratus*" has been crossed out and the species name "*californiensis*" has been written over the name "*pectinulatus*" (in pencil) in a handwriting I do not recognize, although it may be Pilsbry's. To the right of the position of the larger specimen on the card is a pen-written note "2nd measurement / M.C. p. 128", which I assume to be one of the measurements published in the Manual of Conchology. Both specimens in ANSP No. 118662 unquestionably are typical *Lepidozona californiensis* as described by Berry from southern California. The locality "Monterey / Cal." is incorrect as Berry's *californiensis* is not known to occur as far north as Monterey. Presumably these Stearns' specimens are the basis for the previously published range for *Lepidozona clathrata* (Reeve, 1847) as extending from "Monterey and San Diego, to La Paz, L. California" (Pilsbry, 1892: 128). The verified range for *L. californiensis* (and therefore for *L. pectinulata*) extends from Isla Vista, Santa Barbara County, California, to Punta Abreojos, Baja California, on the Pacific side of the peninsula; *L. clathrata* is known only from the Gulf of California. A color slide of Stearns' two "Monterey" specimens is CASIZ No. 2970 (AGS).

There is no doubt in my mind that the 13 specimens in ANSP No. 118664 represent the true *Lepidopleurus pectinulatus* as understood by Carpenter and by older collectors such as Henry Hemphill, although at first only in part by Pilsbry, whose inclusion of the Carpenter name under Reeve's *L. clathrata* has created taxonomic difficulties. On the basis of the foregoing, albeit somewhat subjective, I hereby select the 13 specimens comprising ANSP No. 118664 as the syntype series of *Lepidozona pectinulata* (Carpenter in Pilsbry, 1893). Selection of an appropriate lectotype from this series of specimens is left to the next reviser; preferably this should be an entire specimen, with the remaining 12 specimens designated as paralectotypes. Color slides of an appropriate lectotype that might be so selected are CASIZ Nos. 3118. 3119 (Ferreira).

Chiton petaloides Gould, 1846

Chiton petaloides Gould, 1846:144; 1852:328, plt. 28, figs. 435a-b:1862, p. 6. Johnson, 1964:126.

Lucia petaloides (Gould, 1846). Gould, 1862:240, 242; Johnson, 1964:126.

Lophyrus petaloides (Gould, 1846). Pease, 1872:194.

Ischnochiton (Ischnochiton) petaloides (Gould, 1846). Pilsbry, 1892:118-119, plt. 23, figs. 92, 93.

Radsiella petaloides (Gould, 1846). Thorpe (*in* Keen, 1971): 869 (with syns. *Ischnochiton mariposa* Dall, 1919, and *Stenoplax histrio* Berry, 1945).

Holotype: U.S.N.M. No. 12922.

Type locality: "Sandwich Ids."

Remarks: The holotype now consists of 5 separate valves, including 4 intermediate valves and a tail valve; no portion of the girdle remains. An older museum label reads: "*Chiton petaloides* Gould / Sandwich Ids"; a later one reads: "*Ischnochiton petaloides* Gould / 4997 (over) Type / Hawaiian Ids. U. S. Expl. Exp." The reverse side of this label says: "Gould fig. 435", which agrees with the 1852 Gould citation, above. Pilsbry (1892) indicated the range more specifically as occurring on the islands of Kauai and Oahu.

Until recently, *Ischnochiton petaloides* has been known for certain only from its incomplete holotype. However, a large lot of 100 specimens, preserved in alcohol, was collected by Mrs. Harold (Kay) Gudnason of Moraga, California, in 1973 and 1974 in the low intertidal zone at Maili, Oahu. They occurred in association with the endemic small chiton, *Rhyssoplax linsleyi* Burghardt, 1973. These Hawaiian specimens have been made available through the courtesy of Mrs. Gudnason and as a result have contributed greatly to a knowledge of the species.

According to Gould (1862), *Ischnochiton petaloides* has "a very beautiful and peculiar shell, its markings resembling the venated petals of some flowers." Mrs. Gudnason's specimens bear out Gould's statement. Without doubt it is one of the loveliest of all the small chitons from the Eastern Pacific with which I am familiar. The normal color pattern has a whitish or very light beige background with superimposed narrow dark streaks or "venations"; the lateropleural areas have splotches of orange-red or flame-red with a scattering of round, brilliant, ultramarine blue spots; occassionally on some valves there are small areas of red-brown usually on or near their apices. (The valves of the holotype apparently have faded over the years as they do not have the red colored areas or the blue spots.) Only 8 of the 100 specimens in Mrs. Gudnason's collection have different color patterns: 1 is completely white; 2 are completely bluish-black; 2 have the same bluish-black coloration but with a prominent whitish stripe along the jugum; 1 is variegated with dark and light marblings; and 2 have the concentric alternating pinkish or darker red-brown color bands that have been termed "zebra stripes". The typical blue spots still show through the color on all but the white and "zebra-striped" shells.

The dorsal sculpture on most of Mrs. Gudnason's specimens is subobsolete. While Gould's statement that the lateral areas are "very prominent" is borne out by the remaining valves of the holotype, this is not generally true for the species. Also, while the longitudinal ribbing of the central areas on the holotype valves is fairly prominent and extends well up the side-slopes toward the smooth jugal area, there is considerable variation in this particular sculptural character, with the longitudinal ribs almost nonexistant in many specimens of *Ischnochiton petaloides* collected recently.

The girdles of *Ischnochiton petaloides* have the longitudinally-striated, closely-packed, overlapping scales that are typically ischnochitonoid. They are whitish with alternating narrow bands of a combination of greenish-gray with occasionally interspersed blackish scales.

As indicated earlier in the discussion of *Ischnochiton mariposa* Dall, 1919, there can be no doubt that this Gulf of California species must fall into the synonymy of *I. petaloides* (Gould, 1846). West Coast chitons heretofore identified as *I. mariposa* tend to run somewhat larger in adult size; the colors appear to be more brilliant with more frequent color-patterns that vary from the normal marbled or venated with red areas and superimposed blue spots. The over-all light green and red-brown color phases occurring on occasional specimens of *I. mariposa* have not yet turned up on *I. petaloides*.

The discontinuous distribution of *Ischnochiton petaloides* in the Eastern Pacific is remarkable. The North American West Coast population occurs mostly in the Gulf of California. A second, separate population, difficult if not impossible to differentiate from the one in the Gulf of California, occurs on the Galápagos Islands. Thus, the Gulf population is separated from the one in the Galápagos by more than 3200 km and from the one in Hawaii by around 4800; the Galápagos and Hawaiian populations are more than 7250 km apart. The intervening vast stretches of the Pacific Ocean make this a most unusual distribution anomaly for a chiton in the family Ischnochitonidae.

Color slides of the holotype of *I. petaloides* are CASIZ Nos. 3266, 3267 (AGS). Slides of recently collected specimens are CASIZ Nos. 3269, 3270 (AGS).

Leptochiton punctatus Whiteaves, 1886

Leptochiton punctatus Whiteaves, 1886:125-126, figs. 3, 4.

Ischnochiton (Trachydermon) retiporosus var. [= ssp..] *punctatus* (Whiteaves, 1886). Pilsbry, 1894:78.

Ischnochiton (Ischnochiton) retiporosus punctatus (Whiteaves, 1886). Dall, 1921:191.

Ischnochiton retiporosus punctatus (Whiteaves, 1886). Oldroyd, 1924:191; 1927:273; La Rocque, 1953:13. Abbott, 1974:395.

Ischnochiton (Lepidozona) retiporosus punctatus (Whiteaves, 1886). Smith, 1947b:18 (listed only).

Holotype: Not indicated by Whiteaves; location not known to me.

Type locality: Duncan Bay, Discovery Passage, Vancouver Island, British Columbia, Canada, in 10-25 fathoms [18.3-45.7 m], sand and gravel bottom.

Remarks: *Leptochiton punctatus* is based on a single specimen, its whereabouts unknown. Whiteaves' drawing of an intermediate valve illustrates *Ischnochiton retiporosus* Carpenter, 1864, quite well. Pilsbry (1894) lists it as a color variety and later authors as a subspecies of *I. retiporosus*. There appears to be no valid reason for retaining the name *punctatus*, which should be included in the synonymy of *I. retiporosus*.

Ischnochiton (Ischnochiton) radians
Carpenter in Pilsbry, 1892

Ischnochiton (Ischnochiton) radians Carpenter in Pilsbry, 1892:121; 1894:75, plt. 16, figs. 48, 49; 1898a:287. Dall, 1921:191; Smith, 1974b:18 (listed only); Smith & Gordon, 1948:2-7.

Ischnochiton radians Carpenter in Pilsbry, 1892. Taylor: 1899:250; Keep, 1904:249; Berry, 1907:51; 1917:231, 235; 1927:164; Thiele, 1909:80, plt. 7, fig. 62; Oldroyd, 1924: 191; 1927:275-276; Burch, 1942:7; Burch & Burch, 1943a:5; Palmer, 1945:101; 1958:274-275, plt. 30, fig. 13; plt. 31, figs. 8-17; LaRocque, 1953:13; Light's Manual (2nd ed.), 1934:218, 219; Tomlinson, 1959:36; Thorpe, 1962:205, 207; Burghardt & Burghardt, 1969b: 17, plt. 1, figs. 17-19 (in color) (syn. of *I. interstinctus* (Gould, 1846)); Abbott, 1974:395; Light's Manual (3rd ed.), 1975:465 (= *I. interstinctus).*

Ischnochiton interstinctus var. *radians* Carpenter in Pilsbry, 1892. Leloup, 1940:3, 7-9, figs. 19-24.

Lectotype: Redpath Museum, Montreal, Canada, No. 25; designated by Palmer (1958).

Paralectotypes: Redpath Museum, No. 25, 3 additional specimens. U.S. National Museum of Natural History, Division of Mollusks, No. 19471.

Remarks: I have not seen the Redpath Museum lectotype. However, the paralectotype in the U.S. National Museum was obtained on loan; it consists only of the head valve and 3 pieces of intermediate valves with no portion of the girdle.

The close relationship between this species and *Ischnochiton interstinctus* (Gould, 1846) has been mentioned already in the discussion of the latter. Leloup provides a detailed account under the heading *"Ischnochiton interstinctus* Gould, 1846 var. *radians* Pilsbry, 1893 [= 1892]". *Ischnochiton radians* is known. There are no difficulties in identifying it. The spectacular color variations in specimens, especially from the Monterey Bay area, which can range from completely black to pure white through a bewildering combination of mixed colors often involving ultramarine blue, generally have led chiton specialists to treat it as a species distinct from the unicolored, reddish-brown *I. interstinctus* from the Puget Sound, Washington, area. However, the *"radians"* color variants, several of which are illustrated in color by Burghardt & Burghardt (1969b, plt. 1, figs. 17-19), are not restricted to the Monterey Bay and the central California area. They have been collected in Departure Bay, British Columbia, and on Dall Island, southeast Alaska according to Berry (1927), and by the Rev. Elwood B. Hunter at No-Thoroughfare Bay, Sitka, also in southeast Alaska (CASIZ Colln.). Strictly on shell characters, especially when one looks beyond the color to the valve sculpture, the case for a separation into two species, or even as geographically different subspecies, breaks down. While one may regret the loss of a well-established name that has been in constant use since Pilsbry defined it in 1892, for taxonomic reasons there seems to be no proper course other than to follow the lead of Burghardt & Burghardt (1969b), who treat *I. radians* as a synonym of *I. interstinctus*. The synonymy of *I. radians*, preceding, therefore should be added to that of *I. interstinctus*, previously shown in detail.

A 35 m color slide of the U.S.N.M. paralectotype (No. 19471) is deposited in the CASIZ Color Slide Series, No. 2047.

Ischnochiton (Trachydermon) retiporosus Carpenter, 1864

Ischnochiton (Trachydermon) retiporosus Carpenter, 1864b: 603, and reprint 1872:89, *nomen nudum;* ibid.:649, and reprint 1872:135; 1965:59-60. Pilsbry, 1892:75.
Trachydermon retiporosus (Carpenter, 1864). Cooper, 1867: 22.
Ischnochiton retiporosus Carpenter, 1864. Pilsbry, 1894:77, plt. 16, figs. 47 (type), 50-53 (as "*reteporosus*", typ. err.); Keep, 1904:349 (as "*reteporosus*"); Willett, 1919:27; Dall, 1921:191; Oldroyd, 1924:190; 1927:272; Burch, 1942:7; LaRocque, 1953:13; Burghardt & Burghardt, 1969b:17-18, 43, plt. 2, fig. 21 (in color); Kues, 1974b:366; Abbott, 1974:395.
Ischnochiton (Lepidozona) retiporosus Carpenter, 1864. Berry, 1917:231, 235-236; 1927:164; Smith, 1947b:18 (listed only). Smith & Gordon, 1948:208; Palmer, 1958: 275, plt. 30, fig. 7; plt. 35, figs. 4, 5.
Lepidozona retiporosa (Carpenter, 1864). Carlisle, 1969: 241.

Holotype: U.S.N.M. No. 4499.

Type locality: Puget Sound, Washington.

Remarks: The holotype of *Ischnochiton retiporosus* is a complete specimen, which exhibits its described characters very well. Study of it confirms the current understanding of the species and chiton specialists should be able to identify it without trouble. It should be listed now as a *Lepidozona.* It has a deep-water habitat, seemingly dredged in progressively greater depths toward the southern end of its range, which in the north has been recorded from Forrester Island, southeast Alaska, west and south of Dall Island, in 15-50 fathoms [27-92 m] (Willett, 1919), to off the southern end of the Baja California peninsula in about 230-250 fathoms [423-453 m] (Kues, 1974b). Thus, the range is extensive, from about 55°-24° North latitude.

A color slide of the holotype of *Lepidozona retiporosa* (Carpenter, 1864) is deposited as CASIZ No. 2045 (AGS).

Ischnochiton ritteri Dall, 1919

Ischnochiton ritteri Dall, 1919:505. Oldroyd, 1927:272; La Rocque, 1953:14; Burghardt & Burghardt, 1969b:18 (syn. of *I. trifidus* (Carpenter, 1864)); Abbott, 1974:395.
Ischnochiton (Ischnochiton) ritteri Dall, 1919. Dall, 1921: 190; Smith, 1976b:18 (listed only).

Holotype: U.S.N.M. No. 218759.

Type locality: "Channel at Juneau, Alaska, Harriman Alaska Expedition, collected by Professor W. E. Ritter."

Remarks: The holotype has been partially disarticulated. It consists of a portion of the girdle with valves ii, iii, iv, and v in place, the other valves being separate. There is a separate portion of the girdle, and a separate piece consisting of the dried head and foot with the dried-in radula. Dall's measurements are: length, 22; width, 15; height, 5 mm; he gives the slit-formula as 12 - 2 - 12.

Study of the holotype and comparison with the holotype valves of *Ischnochiton (Trachydermon) trifidus* Carpenter, 1864, as well as with other available specimens of this older species, leaves no shadow of a doubt that Dall has re-described the Carpenter species, which now should be listed as *I. (Tripoplax) trifidus,* Berry (1919) having established a new subgenus to accommodate it. The name *ritteri,* therefore, drops into the synonymy of Carpenter's *trifidus,* as indicated by Burghardt & Burghardt (1969b) without supporting evidence at the time.

I am indebted to Dr. S. S. Berry for the information that in the collection of the Division of Mollusks, U. S. National Museum of Natural History, there is another specimen with the label: "347287 / *Stenoradsia ritteri* / Dall. / Olga / Washington. Engberg." According to Dr. Berry's unpublished notes, this is another example of *Ischnochiton trifidus.*

Color slides of the holotype of *Ischnochiton ritteri* Dall, 1919, are CASIZ Nos. 2175-2177 (Dea Beach photos).

Ischnochiton sarcosus Dall, 1902

Ischnochiton sarcosus Dall, 1902:558. F. Baker, 1902:42; Strong, 1937:194.
Ischnochiton (Stenoplax) sarcosus Dall, 1902. Dall, 1921:190; Oldroyd, 1927:269-270; Smith, 1947b:18 (listed only); 1947c:11.
Stenoplax sarcosa (Dall, 1902). Burghardt & Burghardt, 1969b:35 (syn. of *Stenoplax conspicua* (Pilsbry, 1892)); Abbott, 1974:397 (syn. of *S. conspicua*).

Holotype: U.S.N.M. No. 109043.

Type locality: "... collected at Portuguese Bend, near San Pedro, California, by Mrs. T. S. Oldroyd."

Remarks: The holotype is complete, the dimensions (dry) given as: l., 36; w., 15; and h., 5 mm; slit-formula 8 - 2 - 10. It is a beige-colored *Stenoplax,* as this genus now is understood, the color pattern being more like one of those exhibited by *Stenoplax fallax* (Carpenter in Pilsbry, 1892). Dall compares it with *Maugerella* Carpenter in Dall, 1879, now considered to be a synonym of the genus *Stenoplax,* subgenus *Stenoradsia* Carpenter in Dall, 1879, of which the type species is *Stenoplax conspicua* (Carpenter in Pilsbry. 1892).

Study of the holotype confirms a long-held suspicion that Dall had described a rather unusual color form of *Ischnochiton conspicuus,* the girdle being clothed with scales typical of this common, low intertidal zone, southern California species. Thus, assignment as a synonym of *S. conspicua* by the Burghardts (1969b) and Abbott (1974) is validated.

In providing localities for this species Dall first mentions it as being dredged in 30 fathoms [55 m] off San Martín Island, Mexico. a locality cited also by F. Baker (1902) and A. M. Strong (1937). However, the holotype label indicated it was collected on the coast of southern California, as shown above, and this, rather than San Martín Island, is the correct type locality, the latter being written on the back of the label. The type locality given by Oldroyd (1927) is incorrect. Incidentally, the San Martín Island locality (in 30 fathoms [55 m]) may represent a new depth record for *Stenoplax conspicua.*

Color slides of the holotype of *Ischnochiton sarcosus* Dall, 1902, are CASIZ Nos. 2201-2202 (AGS).

Ischnochiton (Lepidopleurus) scabricostatus
Carpenter, 1864

Ischnochiton (Lepidopleurus) scabricostatus Carpenter, 1864b:612, and reprint 1872:98, *nomen nudum; ibid.*: 649, and reprint 1872:135; 1866:212.

Lepidopleurus scabricostatus (Carpenter, 1864). Cooper, 1867:22; Lowe, 1904:19 (cited in error as *"crebricostatus"*).

Ischnochiton (Ischnochiton) scabricostatus Carpenter, 1864. Pilsbry, 1892:121; 1894:76, plt. 16, figs. 55, 56; Dall, 1921:191; Smith, 1947b:18 (listed only).

Ischnochiton scabricostatus Carpenter, 1864. Pilsbry, 1896: 49-50; 1898a:288; Keep, 1904:349; Oldroyd, 1927:276; Palmer, 1945:101 (as *"I. subexpressus* Cpr. type = *scabricostatus* Cooper No. 518a . . . "); 1958:269, plt. 30, figs. 10-12; Burghardt & Burghardt, 1969b:18; Abbott, 1974:395.

Holotype: U.S.N.M. No. 16268.

Type locality: "Catalina Id. - Cooper."

Remarks: The identity of this small, southern California, subtidal zone chiton has been obscure ever since Carpenter's time and even after Pilsbry covered it in the Manual of Conchology. For this reason, a review of its taxonomic history may be useful.

Carpenter's first mention of the species name (1864b, p. 612) merely lists it as "n. s.," with the locality "Cat. Is., 8-20 fm." Thus it is a *nomen nudum* at this point. However, he validates the name on a later page (p. 649) with the following inadequate description, by present-day standards:

> "Small, arched, orange: rows of prominent granules over shagreened surface. Lobes blunt, slightly rugulose, close to eaves. 8-20 fm. Cp."

In 1866 Carpenter provided an amplified description of the species in Latin, also indicating it as "n.s." although the name must carry the 1864 date. He gives the dimensions as: "long. .30; lat. 0.17: div. 100°." These convert to: l., 7.6; w., 4.3 mm. He indicates the specimen (specimens?) were deposited in the "State Collection, No. 1071 c," which refers to the old California State Collection eventually turned over to the University of California (Berkeley), Department of Paleontology. Unfortunately, most of this old collection is lost; at least it no longer can be identified.

The next mention of the species is by Pilsbry in the Manual of Conchology (1892:121) with the publication of a translation of Carpenter's 1866 Latin diagnosis, which actually is misleading as it echoes the mention of "prominent granules" in the original description by referring to "a radiating series of large granules" on the lateral areas, with the riblets "furnished with large granules" on the central areas, neither of which is borne out by the sculpture on the holotype of *Ischnochiton scabricostatus.* Pilsbry recognized these discrepancies later in the Manual (1894:76) when he redescribed the sculpture accurately and in greater detail, removing the emphasis on prominent granules that are not present. His enlarged drawing of a portion of valve ii (plt. 16, fig. 56) is a faithful rendition, as also is his enlarged sketch of the girdle scales (plt. 16, fig. 55). Both Carpenter and Pilsbry describe the color of the species as "orange," although I would designate the color now as being more nearly a light red-brown, possibly due to fading with age.

A later mention of the species, also by Pilsbry (1896: 49-50), provides the following brief description of a specimen (or specimens) collected at San Pedro, California, by Tom S. Oldroyd:

> "Lateral areas with four (on one side of valve ii, five; on one side of valves iv and v, three) radial riblets, which are *very weakly,* hardly perceptibly, granose. Sutures very feebly crenate. Anterior and posterior valves with 9 slits each. Color reddish (but not at all of an orange cast), with a few inconspicuous white spots on some of the lateral areas. [Collected by T. S. Oldroyd at San Pedro.]

> "The typical specimen of *I. scabricostatus* [U.S. N.M. No. 16,268] was orange with some dark sutural dots, and the lateral areas are three ribbed, some low pustules on the ribs. It was described from Catalina Island."

The holotype is a tiny specimen, obviously a juvenile. The head and tail valves have been disarticulated and are loose; the remaining portion consists of valves ii to vi, inclusive, in place in the somewhat incomplete girdle; valve vii is missing; the dried-in animal appears to be incomplete. With the holotype are two museum labels, both carrying the designation "Type." The earlier label reads: "*Lepidopleurus scabricostatus* Cpr. / Catalina Id. - Cooper"; a later label changes the genus to *Ischnochiton* based on a subsidiary label in Dall's handwriting.

Careful inspection of the holotype, although a juvenile, proves it to be the same as the deep-water species later described as *Ischnochiton (Lepidozona) golischi* Berry, 1919. This later-named species therefore becomes a synonym of *Lepidozona scabricostata* (Carpenter, 1864).

In his report on the chitons collected by Dr. Harold Heath at Pacific Grove, near Monterey, California, Pilsbry (1898a:288) includes a chiton identified as *Ischnochiton scabricostatus*. Among specimens borrowed for study from the Academy of Natural Sciences of Philadelphia was a single specimen with the following museum label: "*I. scabricostatus* Cpr. var. Pacific Grove, nr. Monterey, Cal. / H. Heath!" Dimensions indicated are: l., 15.5; w., 8 mm. The specimen is ANSP No. 72128 and without question is the one referred to by Pilsbry. Doubtless this specimen is another that would have been identified otherwise as *Lepidozona golischi*, confirming the correctness of Pilsbry's identification. The occurrence of this species of *Lepidozona* in Monterey Bay should occasion no surprise in view of the collecting records in the Pacific Northwest mentioned in earlier remarks relating to *L. golischi*.

Enlarged color-slide photographs of the holotype of *Lepidozona scabricostata* are on file as CASIZ Nos. 2974-2977 (AGS) and 3119 (Ferreira).

Ischnochiton (Ischnochiton) sinudentatus
Carpenter in Pilsbry, 1892

Ischnochiton (Ischnochiton) sinudentatus Carpenter MS, Pilsbry, 1892:128 (in sec. *Lepidozona*). Dall, 1921:192 (in sec. *Lepidozona*); Oldroyd, 1927:283 (in sec. *Lepidozona*).

Ischnochiton (decipiens var.?) *sinudentatus* Carpenter in Pilsbry, 1892. Pilsbry, 1898a:288.

Ischnochiton sinudentatus Carpenter in Pilsbry, 1892. Keep, 1904:349; Burch, 1942:7; Palmer, 1945:101; Light's Manual (2nd ed.), 1954:217, 219.

Ischnochiton (Lepidozona) sinudentatus Carpenter in Pilsbry, 1892. Berry, 1922:476-477, table 1, plt. 12, figs. 10-17; Palmer, 1958:276, plt. 30, figs. 8, 9; plt. 33, figs. 1-5; Smith, 1947b:18 (listed only); Smith & Gordon, 1948:208.

Ischnochiton clathratus Reeve, 1847, var. *sinudentatus* Pilsbry, 1893 [= 1892]. Leloup, 1940:3, 17-18.

Lepidozona sinudentata (Carpenter in Pilsbry, 1892). Burghardt & Burghardt, 1969b:22-23, 43-44, plt. 2, figs. 29-32 (in color) (with syn. *L. gallina* (Berry, 1925)); Abbott, 1974:395 (with syn. *L. berryi* (Dall, 1919)); Light's Manual (3rd ed.), 1975:463, 465.

Syntypes: Redpath Museum, Montreal, Canada, No. 27 (4 specimens).

Type locality: "California."

Remarks: Carpenter's label for the 4 specimens in the syntype series preserved dry in the Redpath Museum is in white ink on a glass slide, following his usual label-writing practice. It reads: "Ischnochiton sinudentatus *Cpr.* (Type). California." One of the specimens has valves i, vii and viii disarticulated. This is the largest in the series and is herein designated as the **lectotype** as the separate head and tail valves permit verification of the slit-formula, indicated by Pilsbry as 10-1-9; the loose valves also show the configuration of their ventral surfaces. The lectotype is 12.0 mm long. The other 3 specimens, which become **paralectotypes,** measure 10.0, 6.7, and 4.9 mm in length, respectively.

While the syntype series represents rather small, young specimens, their dorsal sculpture agrees with that occurring on younger specimens in an intertidal zone series collected along the Monterey Peninsula, central California, by the Rev. Elwood B. Hunter (AGS Colln. No. 10545) and with smaller specimens in a series of "*Ischnochiton berryi* Dall, 1919" dredged in 11.0 to 14.6 m in Monterey Bay on the shale bed off Del Monte by A. G. Smith and C. S. Fackenthall (AGS Colln. No. 4571). The dorsal ribbing of "*Ischnochiton decipiens* Carpenter in Pilsbry, 1892" dredged in 25 fathoms [45.7 m] off Redondo Beach, southern California, by John Q. and Tom Burch (AGS Colln. No. 5996) is markedly less prominent and more finely cut than the dorsal ribbing on the Monterey specimens, although the general sculptural arrangement is essentially the same.

As indicated in earlier remarks under each of their respective names, the following belong in the genus *Lepidozona* Pilsbry, 1892, along with *L. sinudentata,* and are so closely related to this species that they should be considered as synonyms of it:

Ischnochiton berryi Dall, 1919
Ischnochiton decipiens Carpenter in Pilsbry. 1892
Ischnochiton (Lepidozona) gallina Berry, 1925
Ischnochiton listrum Dall, 1919.

Although there are slight differences in the type of sculpture occurring on subtidal zone specimens from Monterey Bay and from off southern California, these seem to be well within the limits of individual sculptural variation for the species. A fairly broad interpretation in this instance would appear to be the conservative approach, calling for the assignment of 4 West Coast chiton names as synonyms, with the consequent simplification of taxonomic procedures. This step appeals to me also as making both evolutionary and ecological sense.

Color-slide transparencies of the syntype series of *Lepidozona sinudentata* as well as of the largest specimen designated as the lectotype are deposited as CASIZ Nos. 2075-2077 (AGS) and 3078-3080 (Ferreira).

Ischnochiton stearnsii Dall, 1902

Ischnochiton stearnsii Dall, 1902:557-558. Smith & Cowan, 1966:13-15, fig. 21; Talmadge, 1973:232.
Ischnochiton (Ischnochiton) stearnsii Dall, 1902. Dall, 1921: 192 (in sec. *Lepidozona*); Oldroyd, 1927:283-284 (in sec. *Lepidozona*).
Ischnochiton (Lepidozona) stearnsii Dall, 1902. Smith, 1947b: 18 (listed only).
Lepidozona stearnsii (Dall, 1902). Burghardt & Burghardt, 1969b:23; Abbott, 1974:395 (in subgenus *Tripoplax* Berry).

Holotype: U.S.N.M. No. 109024.

Type locality: "Dredged by the U. S. Fish Commission steamer *Albatross* off the Farallones Islands, near San Francisco, California, at station 3104, in 391 fathoms, coral, bottom temperature 41°F . . ."

Remarks: The holotype consists of the girdle with 4 intermediate valves in place; the head and tail valves are disarticulated and entire; a fifth intermediate valve is broken into 3 pieces. The back of the museum label has a pencilled notation: "1 plate gift to S. S. Berry, 1951," which undoubtedly is in Dr. Berry's collection in Redlands, California. Dall gives the dimensions as: length, about 25; width, 15; height, 6 mm. The slit-formula is 17-2-15.

Ischnochiton stearnsii is a rare, deep-water species of which only 3 specimens are known to have been collected. The major distinguishing features are the large numbers of slits in the end valves, high for most Ischnochitons, and the closely-packed, bluntly-rounded girdle scales, the latter being well illustrated in Smith & Cowan (1966, fig. 21). Dall's reference to "large spines" seems to me to be misleading after a careful examination of the holotype. I would not have used this term, which would more appropriately be applied to the girdle decoration of many species of *Acanthopleura*.

The second specimen of *I. stearnsii* is in the collection of the Los Angeles County Museum of Natural History (No. 10,328). It was taken in 255 fathoms [466 m], 7.2 miles [11.6 km], 190° True from Long Pt., Santa Catalina Island (lat. 33° 24'27"N, long. 118° 13'15"W) by the R/V *Velero IV* during Cruise No. 641 on 13 February 1965. It agrees in practically all essential characters with Dall's original description. All but 2 of the intermediate valves are broken with some of the pieces missing. The head valve has 12 slits remaining, part of the left margin being lost. The teeth between the slits are of irregular size, obsoletely scalloped at the ends. Slit rays show as thin, white lines of more transparent shell material, without punctations. Intermediate valves ii and vii are single-slitted; the others have 2 well developed slits on the right side, the left sides being incomplete.

A third specimen has been reported by Talmadge (1973) from 360 fathoms [648 m] off Trinidad, Humboldt County, California. I have not seen this one.

The girdle scales are unusual for an *Ischnochiton*. They are variable in size and shape, depending on their location in the girdle. In general, they are smooth, subcylindrical, curved, conical, and more elongate than the usual type of *Ischnochiton* girdle scale. They have a concave base and taper abruptly into a blunt apex; the curvature is directed inward. Dall's reference to the "pebbly appearance" of the girdle is apt in this instance, the "pavement-like" aspect being especially noticeable, which seems to be a normal character and not due to wear, as Dall infers. Also, in the Los Angeles Museum specimen, I do not find the mixture of larger and smaller spines and spinules that Dall describes for the holotype but this may be due to a variation between individuals or to a misinterpretation of Dall's description of the girdle characters.

Assignment of *Ischnochiton stearnsii* to a correct taxonomic position in the Ischnochitonidae with any degree of authority is difficult because of the small amount of information about the species. I would place *I. stearnsii* close to *I. abyssicola* Smith & Cowan, 1966, but not with *I. trifidus* Carpenter, 1864, in the subgenus *Tripoplax* Berry, 1919, as indicated by Abbott (1974). Certainly it does not qualify for inclusion in the genus *Lepidozona* Pilsbry, 1892, to which others have referred it since Dall did so in 1921: 192. The establishment of a new subgenus covering *I.*

stearnsii, *I. abyssicola*, and *I. acelidotus* (with syn. *I. exanthematus*) mainly on the peculiarity of the girdle scales of these species is a taxonomic step I hesitate to take without knowing more about these rare and unusual Ischnochitons.

Color slides of the holotype of *Ischnochiton stearnsii* are on deposit as CASIZ Nos. 1030-1033, 1046, 1070, 2050, 2051 (AGS) and Nos. 3120-3122 (Ferreira).

Ischnochiton (Ischnochiton) subclathratus
Pilsbry, 1892

Lepidopleurus clathratus Carpenter, 1857b:195 (not *Chiton clathratus* Reeve, 1847, *fide* Pilsbry, 1892:194); Brann, 1966:45, fig. 253.

Ischnochiton clathratus Carpenter MS, Pilsbry, 1892:124-125.

Lepidopleurus subclathratus (Pilsbry, 1892). Keen, 1968:434, plt. 39, fig. 97.

Ischnochiton (Ischnochiton) subclathratus Pilsbry, 1892. Pilsbry, 1892:124; Keen, 1958:521 (with syn. *Lepidopleurus clathratus* Carpenter, 1856, not Reeve, 1847); Thorpe (*in* Keen, 1971):875 (syn. of *Lepidozona elenensis* (Sowerby, 1832)); Ferreira, 1974:164, 165 (syn. of *Lepidozona clathrata* (Reeve, 1847)).

Holotype: British Museum (Natural History).

Type locality: "Mazatlan [Sinaloa, Mexico], under a stone."

Remarks: Carpenter based his species on a single, very small specimen. His description and comments point to the probability that it is merely the juvenile stage of the fairly common Panamic *Lepidozona clathrata* (Reeve, 1847). This is supported by a photograph and sketch of the type specimen in the British Museum (N. H.) furnished by Dr. Myra Keen. Carpenter's drawing, as reproduced by Brann (1966, fig. 253) is crude and not representative. Thorpe (*in* Keen, 1971) places *Lepidopleurus clathratus* Carpenter, 1857 (not Reeve, 1847) and *Ischnochiton subclathratus* Pilsbry, 1892, in the synonymy of *Lepidozona elenensis* (Sowerby, 1832) giving no reasons or supporting evidence for such an assignment. More recently, Ferreira (1974) has treated *Ischnochiton subclathratus* Pilsbry, 1892, as a synonym of *Lepidozona clathrata* (Reeve, 1847), which I believe available evidence indicates is the correct taxonomic procedure to be followed in this instance.

Ischnochiton (Trachydermon) trifidus
Carpenter, 1864

Ischnochiton (Trachydermon) trifidus Carpenter, 1864b:603, and reprint 1872:89, *nomen nudum*; *ibid.*:649, and reprint 1872:135; 1865:60.

Trachydermon trifidus (Carpenter, 1864). Cooper, 1867:22.

Ischnoradsia trifida (Carpenter, 1864). Dall, 1871:135 (as "*Isnoradsia*," typ. err.); 1879:297, 331-332, plt. 2, figs. 17, 17a (radula teeth); Whiteaves, 1877:126.

Ischnochiton trifidus Carpenter, 1864. Keep, 1904:349; Willett, 1919:27; Oldroyd, 1924:193; Burch & Burch, 1943b:8 (Pleistocene); LaRocque, 1953:14; Burghardt & Burghardt, 1969b:18, 43, plt. 2, fig. 22 (in color) (with syn. *I. ritteri* Dall, 1919).

Ischnochiton (Ischnochiton) trifidus Carpenter, 1864. Pilsbry, 1893:142-152, plt. 18, fig. 40 (in sec. *Radsiella* Pilsbry, 1892); 1894:86-87, plt. 17, figs. 64-67 (in sec. *Ischnoradsia* Shuttleworth, 1853); Dall, 1921:195 (in sec. *Tripoplax* Berry, 1919) ; Oldroyd, 1927:285-286 (in sec. *Tripoplax*).

Ischnochiton (Radsiella) trifidus Carpenter, 1864. Berry, 1917:232-238.

Ischnochiton (Tripoplax) trifidus Carpenter, 1864. Berry, 1919b:1-2; 1927:164; Eyerdam, 1924:28 (sg. "*Trioplax*," typ. err.); Thiele, 1929:17; Smith, 1947b:18 (listed only); 1960:56; Palmer, 1958:277-278; Smith & Cowan, 1966: 11, 13, fig. 20; Abbott, 1974:394.

Holotype: U.S.N.M. No. 30946.

Type locality: " . . . obtained at Sitka in 14 fathoms stony mud, off the fish-house," southeast Alaska (Dall, 1871).

Remarks: The holotype of *Ischnochiton trifidus* now consists of 4 disarticulated valves only. They are complete, however, and include the head, 2 intermediate, and tail valves.

Carpenter's original description is wholly inadequate, as follows:

> "Centre punctures few, deep: 2-4 blunt ribs: side plates with 2 slits."

Fortunately, Pilsbry's clear and detailed diagnosis and good illustrations in the Manual of Conchology make identification of this species relatively easy. It is a rare, subtidal zone species, quite large-sized for a West Coast *Ischnochiton* when fully grown. So far, it is the only species assigned to the subgenus *Tripoplax* Berry, 1919.

Color slides of the holotype valves of *Ischnochiton trifidus* are CASIZ Nos. 2173, 2174 (AGS).

Ischnochiton venezius Dall, 1919

Ischnochiton venezius Dall, 1919:509. Burghardt & Burghardt, 1969b:18; Abbott, 1974:395.

Ischnochiton (Ischnochiton) venezius Dall, 1919. Dall, 1921: 191; Oldroyd, 1927:274; Smith, 1947b:18 (listed only).

Holotype: U.S.N.M. No. 216792.

Type locality: "Near Venice, California (Univ. Southern California)."

Remarks: The holotype is a small, fairly well preserved specimen, with valve viii missing. Dall's measurements are: L., 7; W., 3.5; H., 2 mm. The slit-formula is 12-1-12.

Study of the holotype leaves no doubt, as suspected by the BURGHARDTS (1969), that Dall has re-described a juvenile specimen of *Lepidozona retiporosa* (Carpenter, 1864), which is a reasonably well-known and well-defined West Coast subtidal zone species.

Color slides of the holotype of *Ischnochiton venezius* are CASIZ Nos. 2049, 2966, 2967 (AGS); 3123, 3124 (Ferreira).

Ischnochiton veredentiens Carpenter, 1864

Ischnochiton veredentiens Carpenter, 1864b:612, and reprint 1872:98, *nomen nudum*; ibid.:649, and reprint 1872: 135; 1866:211. COOPER, 1867:22; KEEP, 1904:349; BERRY, 1907:51; OLDROYD, 1927:277; PALMER, 1958:269-270, plt. 29, figs. 9-14; BURGHARDT & BURGHARDT, 1969b:18-19; ABBOTT, 1974:395.

Ischnochiton (Ischnochiton) veredentiens Carpenter, 1864. PILSBRY, 1892:122; DALL, 1921:191; SMITH, 1947b:18 (listed only).

Ischnochiton (Lepidozona) veredentiens Carpenter, 1864. SMITH & GORDON, 1948:208.

Holotype: U.S.N.M. No. 162~~5~~9. 6

Type locality: Santa Catalina Island (J. G. Cooper).

Remarks: The type specimen is a juvenile, which the illustrations show, and which a careful study of it by Dr. Ferreira and by me confirms. It consists of 6 disarticulated valves and at least a portion of the dried animal; the head and one intermediate valve are missing.

PALMER (1958) provides a good taxonomic review of this species. It is, without doubt, a *Lepidozona*, which, as Carpenter states in his original description, is sculptured more nearly like *L. mertensii* (Middendorff, 1847), type of the genus *Lepidozona* Pilsbry, 1892. It is not the same as *Ischnochiton scabricostatus* Carpenter, 1864, which was dredged by Dr. J. G. Cooper off Santa Catalina Island also, and which now is properly assigned to the genus *Lepidozona*. There are two other species of *Lepidozona* that have been dredged in moderately deep water off this southern California Channel Island: *L. catalinae* (Willett, 1941) [= *L. willetti* (Berry, 1917)] from 30 fathoms [55 m], and L. *golischi* (Berry, 1919) [= *L. scabricostata* (Carpenter, 1864)] from 43 fathoms [79 m] (CASIZ Colln.). Until additional specimens of *Lepidozona veredentiens* can be collected and compared with the juvenile stages of the two other Santa Catalina Island species, probably it should continue to be treated as a valid species until proved otherwise.

Color slides of the holotype of *Ischnochiton veredentiens* are CASIZ Nos. 2978 (AGS) and 3125 (Ferreira).

Ischnochiton (Lepidozona) willetti
Berry, 1917

Ischnochiton (Lepidozona) willetti Berry, 1917: 232, 236-238, figs. 1, 2.

Ischnochiton willetti Berry, 1917. WILLETT, 1919: 27; OLDROYD, 1924: 192-193; LAROCQUE, 1953: 13.

Ischnochiton (Ischnochiton) willetti Berry, 1917. DALL, 1921: 192 (in sec. *Lepidozona*); OLDROYD, 1927: 279-280 (in sec. *Lepidozona*).

Lepidozona willetti (Berry, 1917). BURGHARDT & BURGHARDT, 1969b: 23; ABBOTT, 1974: 395.

Holotype: "A shell preserved dry [S.S.B. 159] as Cat. No. 3700 of the author's collection."

Paratypes: California Academy of Sciences, Geology Type Collection, No. 1123; Academy of Natural Sciences of Philadelphia; U. S. National Museum of Natural History; George Willett private collection (in Los Angeles County Museum of Natural History ?).

Type locality: "15-20 fathoms, Forrester Island, Alaska; George Willett, May-July-August, 1914-1916; 36 specimens."

Remarks: This species is a Pacific Northwest subtidal zone *Lepidozona* closely related to *L. scabricostata* (Carpenter, 1864). It should remain valid unless it can be shown to be a synonym of this latter species. *Lepidozona catalinae* (Willett, 1941), already has been assigned herein as a synonym of *L. willetti*.

Color slide of the paratype in the California Academy of Sciences is CASIZ No. 3101 (Ferreira). Additional color slides of the girdle scales of a specimen in the San Diego Museum of Natural History (SDNH No. 23505) are CASIZ Nos. 3126, 3127 (Ferreira).

SCHIZOPLACIDAE

Schizoplax multicolor Dall, 1920

Schizoplax multicolor Dall, 1920:22-23; 1921:189. OLDROYD, 1927: 265-266; SMITH, 1947a:13; 1947b:18 (listed only); LAROCQUE, 1953:11; BURGHARDT & BURGHARDT, 1969b: 36 (syn. of *S. brandtii* (Middendorff, 1847)); ABBOTT, 1974: 399.

3
Holotype: U.S.N.M. No. 3~~8~~3018.

Type locality: "St. Paul Island. Bering Sea," Pribilof Islands (U. S. Bureau of Fisheries).

Remarks: The holotype of *Schizoplax multicolor* is a unique specimen. It consists of the dried animal on which only the tail valve is in place. The remaining valves are loose, the head valve being entire; the 6 intermediate valves are broken apart along the jugal sutures peculiar to chitons of this family. In becoming loosened from the girdle, the insertion plates have been broken off, portions of them remaining in the dried girdle. This may be due to the fact, as indicated on the original museum label, that the specimen was found in the crop of an Eider Duck.

Dall says his new species "differs from the type of the genus *S. brandtii* Middendorff in color, form, characters of the girdle and depression of the body," all of which may be well within the limits of variation in these characters occurring in specimens of the older-named species. Until there is evidence of the existence of more than one species of *Schizoplax* on the Pribilof Islands in particular, or in Alaska in general, which seems unlikely, I recommend *S. multicolor* be treated as a synonym of *S. brandtii* (Middendorff, 1847), as already suggested by the Burghardts (1969).

A color slide of the holotype of *Schizoplax multicolor* is deposited as CASIZ No. 2247 (AGS).

CALLISTOPLACIDAE

Callistochiton acinatus Dall, 1919

Callistochiton acinatus Dall, 1919:510; 1921:194. Oldroyd, 1927:296; Willett, 1937:26; Smith, 1947b:18 (listed only); Burghardt & Burghardt, 1969b:12 (syn. of *C. palmulatus* Carpenter in Pilsbry, 1893); Abbott, 1974: 399.

7
Holotype: U.S.N.M. No. 2187~~1~~3.

Type locality: "Shore at San Pedro, California."

Remarks: This taxon is based on a single individual. The holotype now is in 3 pieces, valves i and ii in place in one, valves iii-vii in another, with valve viii being separate. The specimen is small, obviously a juvenile, Dall's measurements being: length, 6; width, 3; height, 1.5 mm.

Careful study of the dorsal sculpture of the holotype reveals no characters that differ in any marked particulars from young specimens of *Callistochiton palmulatus* Carpenter in Pilsbry, 1893. *C. acinatus*, therefore, should be relegated to the synonymy of *C. palmulatus*, as indicated by the Burghardts (1969).

A color slide of the holotype of *Callistochiton acinatus* is CASIZ No. 1991 (AGS).

Callistochiton celetus Dall, 1919

Callistochiton celetus Dall, 1919:510-511; 1921:104. Oldroyd, 1927:296-297; Smith, 1947b:18 (listed only) ; Burghardt & Burghardt, 1969b:12 (syn. of *C. palmulatus*); Abbott, 1974:399.

Syntypes: U.S.N.M. No. 218770.

Type locality: "Shore at San Pedro, California."

Remarks: The type lot of *Callistochiton celetus* consists of 2 specimens, one entire, the other now in 3 pieces, having been partly disarticulated. Study of these 2 specimens provides no basis whatever for separating them from subadult specimens of *C. palmulatus* Carpenter in Pilsbry, 1893. *C. celetus*, therefore, becomes another synonym of *C. palmulatus* along with *C. acinatus* Dall, 1919, and confirms the earlier assignment by the Burghardts (1969).

The entire specimen of the syntype series is designated herein as the **lectotype** of *Callistochiton celetus;* the disarticulated specimen becomes a **paralectotype**. A color slide of the syntype series is on file as CASIZ No. 1990 (AGS).

Callistochiton chthonius Dall, 1919

Callistochiton chthonius Dall, 1919:511-512; 1921:194. Oldroyd, 1927:298; Smith, 1974b:18 (listed only); Burghardt & Burghardt, 1969b:12 (syn. of *C. decoratus* Pilsbry, 1893); Abbott, 1974:399 (syn. of *C. decoratus).*

Holotype: U.S.N.M. No. 109488.

Type locality: San Pedro, California (Oldroyd).

Remarks: *Callistochiton chthonius* is based on a single specimen, the holotype. It is a well preserved adult, entire, colored blackish-brown over-all, with a length of 21.5 mm. Comparison with other adult specimens of *C. decoratus* Pilsbry, 1893, leaves no doubt that Dall has re-described this fairly common, southern California, intertidal zone species. *Callistochiton chthonius*, therefore, must be included in the synonymy of *C. decoratus*, as indicated by Burghardt & Burghardt (1969) and Abbott (1974) although not accompanied at the time by any supporting evidence for this assignment.

A color slide of the holotype of *Callistochiton chthonius* Dall, 1919, is CASIZ No. 1988 (AGS).

Callistochiton connellyi Willett, 1937

Callistochiton connellyi Willett, 1937:25-26, plt. 2, fig. 13. Chace, 1942:43; Smith, 1947b:18 (listed only); Smith & Gordon, 1948:208; Burghardt & Burghardt, 1969b:11, 43, plt. 1, fig. 4 (in color); Abbott, 1974:399.

Holotype: Los Angeles County Museum of Natural History, No. 1048.

Paratypes: Academy of Natural Sciences of Philadelphia; private collections of Mr. and Mrs. Philip M. Connelly and George Willett (in Los Angeles County Museum ?).

Type locality: "Arbolitos Point, near Ensenada, Lower California, Mexico."

Remarks: According to Willett (1937) there were 40 specimens in the type lot collected by the Connellys. The specimens are all small, the holotype measuring: length, 6; width, 3.4; height, 1 mm; I believe them to be juveniles. The Point Pinos record (Monterey County, California) reported by Chace (1942), is, I am certain, based on juveniles of *C. palmulatus* Carpenter in Pilsbry, 1893 (or its "variety" *mirabilis* Pilsbry, 1893) as I have collected these myself many times along the Monterey Peninsula, especially in the Great Tide Pool at Point Pinos. A black-and-white photograph of the holotype in the Los Angeles County Museum of Natural History provided by Dr. James McLean does not belie its identity with juvenile *C. palmulatus*. Willett himself compares his species with *Callistochiton acinatus* Dall, 1919, which previously herein has been determined to be synonymous with *C. palmulatus*.

On the basis of the above, I recommend assigning *Callistochiton connellyi* Willett, 1937, to the synonymy of *C. palmulatus* Carpenter in Pilsbry, 1893.

Callistochiton cyanosus Dall, 1919

Callistochiton cyanosus Dall, 1919:511; 1921:194. Oldroyd, 1927:298-299; Smith, 1947b:18 (listed only); Burghardt & Burghardt, 1969b:12 (syn. of *C. decoratus* Pilsbry, 1893); Abbott, 1974:399 (syn. of *C. decoratus*).

Holotype: U.S.N.M. No. 109317.

Type locality: "Long Beach, San Pedro, California, Mrs. Hartwell."

Remarks: This taxon is based on a single specimen, the holotype. It is partly disarticulated with valves vii and viii separate; little is left of the girdle. The color is a very pale green with the posterior portion of the latero-pleural areas of all valves tinged with a light yellow-brown. The sculpture is clean-cut and sharp, the central areas pitted. Like *Callistochiton chthonius* Dall, 1919, preceding, *C. cyanosus* cannot be separated from *C. decoratus* Pilsbry, 1893, and therefore becomes a synonym of this latter, earlier-described species, an assignment already indicated by the Burghardts (1969) and Abbott (1974). Such differences that exist between the two species in both sculpture and color are, I am convinced, well within the limits of variation one finds in specimens of *C. decoratus* from various localities along the coast of southern California.

A 35 mm color slide of the holotype of *Callistochiton cyanosus* Dall, 1919, is CASIZ No. 1989 (AGS).

Callistochiton decoratus punctocostatus Pilsbry, 1896

Callistochiton decoratus punctocostatus Pilsbry, 1896:50. Dall, 1921:194; Berry, 1922:481-483, table 1, plt. 14, figs. 1-6 (Pleistocene); Oldroyd, 1927:295; Smith, 1947b: 18 (listed only); Smith & Gordon, 1948:208; Abbott, 1974:399.

Holotype: Academy of Natural Sciences of Philadelphia.

Type locality: Southern California (San Pedro).

Remarks: Although I have not had the holotype of this subspecies at hand for study, I am of the opinion that the sculptural differences from the nominate species, as indicated by Pilsbry (1896), are within the limits of sculptural variation that occurs among individuals and thus do not provide any sound criteria for the establishment of a subspecies name. As indicated above under the remarks on *Callistochiton cyanosus*, the pitted sculpture on the central areas of *C. decoratus* is somewhat variable in unworn specimens but it varies also on older specimens with wear due to age. I therefore recommend the subspecies *punctocostatus* Pilsbry, 1896, be dropped as having no special taxonomic validity and listed in the synonymy of *C. decoratus* Pilsbry, 1893.

Callistochiton fisheri Dall, 1919

Callistochiton fisheri Dall, 1919:512; 1921:194. Oldroyd, 1927:297; La Rocque, 1953:12; Thorpe (*in* Keen, 1971): 873 (syn. of *C. pulchellus* Gray, 1828); Abbott, 1974:399.

Syntypes: U.S.N.M. No. 110353 (6 specimens).

Type locality: "Glory of Russia Bay, Tanaga Island, Aleutions, on a sponge thrown up by the surf; W. J. Fisher."

Remarks: The 6 specimens in the syntype series are small and curled, some of the valves being loose. The original label has a question mark (?) written in after the phrase "Aleutian Islands," indicating doubt about the locality. Such doubt seems justified; chitons of the genus *Callistochiton* have not hitherto been reported as collected as far north as the Aleutian Islands. The dorsal sculpture on the central areas of the intermediate valves consists of irregular, diamond-shaped pits formed by the intersections of diagonal ribs rather than the combination of longitudinal and lateral ribbing, which forms squarish pits. This type of sculpture is characteristic of the South American *Callistochiton pulchellus* Gray, 1828, but not of any other West American *Callistochiton.*

Because of the doubt surrounding the locality of *Callistochiton fisheri* (quite possibly due to a misplacement of locality labels), and because no other specimens have been reported as collected since Fisher obtained the syntype series, it should probably remain as a synonym of *C. pulchellus,* as assigned by Thorpe (*in* Keen, 1971). It might be noted that W. J. Fisher participated as a naturalist with the USS *Tuscarora* Telegraph Sounding Expedition and collected along the peninsula of Baja California in the 1870's.

A color slide showing 4 of the specimens of *Callistochiton fisheri* in the syntype series is CASIZ No. 1933 (AGS).

Acanthopleura fluxa Carpenter, 1864

Acanthopleura fluxa Carpenter, 1864:612, and reprint 1872: 98, *nomen nudum; ibid.*:649, and reprint 1872:135; 1866; 211. Cooper, 1867:22.

Chiton (Nuttallina) scabra Reeve, 1847. Orcutt, 1885:544.

Nuttallina scabra (Reeve, 1847). Pilsbry, 1893:280-281, plt. 54, figs. 21, 22; plt. 56, figs. 19, 20 (with syns. *Chiton scaber* Reeve and *Acanthopleura fluxa* Carpenter); Raymond, 1894:133-134; Keep, 1904:267, 349; 1911:258; 1935:29; M. Smith, 1907:67; Lowe, 1913:28.

Nuttallina californica (Reeve, 1847) var. *scabra* (Reeve, 1847). Leloup, 1940: 3, 25-27.

Nuttallina cf. *N. fluxa* (Carpenter, 1864). Berry, 1918:63; Chace & Chace, 1919:42 (Pleistocene); Berry, 1922:441.

Nuttallina fluxa (Carpenter, 1864). Pilsbry, 1898:290 (= *Chiton scaber* Rve., 1847, not of Blainville, 1825); Dall, 1921:190; Oldroyd, 1927:264-265 (new name for *N. scabra* Reeve); Berry, 1935:89-90, 2 figs. (9 valves); A. Smith, 1947a:16; 1947b:18 (listed only): Palmer, 1958: 265-266, plt. 28, figs. 16-19; A. Smith, 1963:148; McLean, 1969:61-62, fig. 34,4; Burghardt & Burghardt, 1969a:228 (less than 8 valves); 1969b:32, 44, plt. 4, fig. 66 (in color); Abbott, 1974:400, fig. 4694a (with syn. *Chiton scaber* Reeve, 1847, not Blainville, 1825).

Holotype: U.S.N.M. No. 15690b.

Type locality: The first mention of a locality is "Cat. Is." [i.e., Santa Catalina Island, California] (Carpenter, 1864: 612); the second mention (*ibid.*:649) is a tabular reference to the islands in the Santa Barbara group: the third (Carpenter, 1866:211) cites "Santa Barbara Island, Cooper." Two separate labels with the holotype specimen state the type locality as: "Santa Barbara Cooper." Cooper, who undoubtedly collected the first specimens of *Acanthopleura fluxa,* which he sent to Carpenter, gives the locality as "Catalina I., or Santa Barbara I., Cal." (Cooper, 1867:22). As the above offers a choice as to type locality, I hereby select the first-cited one, viz. Santa Catalina Island in the southern Santa Barbara Channel off Los Angeles County, California.

Remarks: The holotype of *Acanthopleura fluxa* Carpenter, 1864 [= *Nuttallina fluxa (Carpenter,* 1864)] which is preserved dry in the U. S. National Museum of Natural History, is complete and in relatively good condition. It has been partially disarticulated, valves i, ii, and viii being separate.

The taxonomic history of *Nuttallina fluxa* is complicated and a review of it may be of some interest to chiton taxonomists. It originates with two chiton species published and illustrated in the Conchologia Iconica (vol. 4, Chitonidae) by Reeve in 1847. These are: *Chiton californicus* Nuttall MSS, with the habitat "California" (plt. 16, species no. and fig. 89, and detail of sculpture of valves vii and viii of species no. 89); and *Chiton scaber* Reeve (Mus. Cuming), with habitat "Central America" (plt. 17, species no. and fig. 106, and sculptural detail of valves vii and viii of species no. 106).

Carpenter's original description of *A. fluxa* is meager, as follows:

> "Green mottled with orange-red; not beaked; with only marginal and diagonal ribs."

Later (1866), however, he amplified it considerably in Latin. He undoubtedly recognized the occurrence of at least two species of *"Acanthopleura"* on the West Coast as he lists *"Acanthopleura scabra,* Rve. = *Californicus* Nutt." from as far north as Puget Sound, Washington, as well as his new species from Santa Catalina Island, California, in his report to the British Association for the Advancement of Science, published in 1864.

The next taxonomic treatment is by Dall (1871), who introduced the genus *Nuttallina* for the first time, but without description, citing "*Nuttallina scabra* (Rve.) Cpr.", the genus name taken from Carpenter's unpublished MS and the species name evidently referring to *Chiton scaber* Reeve, 1847. Later, in 1879, Dall provided an adequate description of *Nuttallina* based on Carpenter's MS and designated "*N. scabra* Rve." as the type species. Thus *Nuttallina* Carpenter in Dall, 1879, has as its type species *Chiton scaber* Reeve, 1847 [= *Chiton californicus* Nuttall in Reeve, 1847], by original designation. This follows Carpenter's treatment of the two Reeve species as conspecific and assumes the type species of *Nuttallina* to be the northern rather than the southern form. The treatment I gave to *Nuttallina* in the Treatise on Invertebrate Paleontology (Smith, 1960:60) therefore is incorrect both as to the date of the genus name and its type species and should be corrected from "*Nuttallina* Dall, 1871 [**Chiton scaber* Reeve, 1847 . . ." to "*Nuttallina* Dall, 1879 [**Chiton scaber* Reeve, 1847, *non C. scaber* de Blainville, 1825 = *C. californicus* Nuttall in Reeve, 1847] . . ."

Dall's synonymy of his new genus *Nuttallina* is confusing and incomprehensible. It was listed as follows:

> "*Chiton scaber* Reeve, Conch. Icon. Mon. *Chiton*, pl. xxii, f. 106, 1847.
>
> *Chiton Californicus* (Nutt. MS) according to Carpenter.
>
> Not *Chiton Californicus* (Nutt. MS) according to Reeve.
>
> *Acanthopleura scabra* Cpr. Suppl. Rep. Br. Assoc., 1863, p. 649."

From this, one can only infer that Dall did not then recognize the occurrence of two separate West Coast species of *Nuttallina*.

The next reviser is Pilsbry in the Manual of Conchology (1893, (1), 14:277-281), who did recognize the existence of two West Coast species of *Nuttallina: N. californica* (Nuttall in Reeve, 1847), with a range from "Vancouver Island south to Piedras Blancas, near San Simeon, San Luis Obispo Co., California" and *N. scabra* Reeve, 1847, ranging from "Santa Barbara Islands and San Diego to between Scammon's Lagoon and Pta. de Abreojos, Lower California." Pilsbry pointed out that there was still "a considerable stretch of coast from which we have no record, or at least no record in which the two forms are discriminated." Pilsbry states the type of the genus *Nuttallina* is "*N. scabra* Cpr. = *Ch. californicus* (Nutt.) Rve." This seems to infer that Carpenter's *Acanthopleura scabra*, indicated as being equivalent to *Chiton californicus* Reeve, is not the same species as *Chiton scaber* Reeve, thus leaving the latter name available for the southern species of *Nuttallina*. Such an inference is not clear to me although it may be borne out by a study of Carpenter's MS, which was available both to Dall and to Pilsbry.

In 1898, describing *Nuttallina thomasi* n. sp. from Pacific Grove, California, a small, rare, low intertidal zone species, Pilsbry indicates (in a footnote) that *Chiton scaber* Reeve, 1847, was preoccupied by *Chiton scaber* Blainville, 1825, which was established for a totally different species from the "Seas of New Holland," now assigned to the family Acanthochitonidae. Regardless of prior taxonomic applications of the name *Chiton scaber* Reeve, this settles the question whether this name properly applies to the northern or the southern species of *Nuttallina* and clears the way for the correct use of *Chiton californicus* Nuttall in Reeve, 1847, for the northern one and *Acanthopleura fluxa* Carpenter, 1864, for the southern one.

So far as I know, the distributions of *Nuttallina californica* and of *N. fluxa* along the West Coast have not been firmly established, especially the northern end of the range of the former and the southern end of the range of the latter species. However, Raymond (1894), who made a study of specimens he collected in northern and southern California, reported that the break point between the two occurred at Point Conception, Santa Barbara County, California. Although this has since not been verified it probably is close to being the correct one.

In working out the above synonymy for *Nuttallina fluxa* (Carpenter, 1864) I have cited only those references that apply definitely to the southern species. Color slides of the holotype are CASIZ Nos. 2238-2240 (AGS).

Callistochiton periconis Dall, 1908

Callistochiton periconis Dall, 1908:355-356. Keen, 1958:522; Thorpe (*in* Keen, 1971):873 (syn. of *C. pulchellus* Gray, 1828).

Holotype: U.S.N.M. No. 110763.

Type locality: "Perico Island, Panama Bay, collected on the reefs by the 'Albatross' party."

Remarks: The holotype of *Callistochiton periconis* is an entire specimen, dry-preserved and fairly flat; it is 7.9 mm long. Although Dall differentiates it from *C. pulchellus* Gray, 1828, these differences seem to be well within the limits of sculptural variation occurring in this latter species. This, and the fact that Panama is within the range of *C. pulchellus*, lead to the conclusion that the two are conspecific. Assignment of *C. periconis* as a synonym of *C. pulchellus* by THORPE (*in* KEEN, 1971), therefore seems to be correct taxonomic procedure.

A color slide of the holotype of *Callistochiton periconis* is deposited as CASIZ No. 1927.

CHAETOPLEURIDAE

Lepidopleurus bullatus Carpenter, 1857

Lepidopleurus bullatus Carpenter, 1857a:252, *nomen nudum;* 1857b:195-196. BRANN, 1966:45, fig. 254; KEEN, 1968:434, plt. 59, fig. 95; THORPE (*in* KEEN, 1971):877 (syn. of *Chaetopleura lurida* (Sowerby, 1832)).

Chaetopleura bullata (Carpenter, 1857). PILSBRY, 1892:31-32.

Chaetopleura (Chaetopleura) bullata (Carpenter, 1857). KEEN, 1958:524.

Holotype: British Museum (Natural History), Tablet No. 902 (Mazatlan Colln.).

Type locality: "Mazatlan; off Spondylus calcifer, extremely rare; *L'pool Col.*"

Remarks: A photograph of the holotype of *Lepidopleurus bullatus* in the British Museum (N. H.), provided by Dr. Myra Keen, shows it to consist of the girdle with all except the tail and one intermediate valve in place, these two being loose. The specimen is a juvenile, Carpenter's dimensions being: "Long., 0.17; lat., 0.12; alt., 0.03" (converting to 4.3, 3.0, and 0.8 mm, respectively). Carpenter's original description and his rather crude sketches reproduced by BRANN (1966), and Dr. Keen's photograph (plus her accompanying sketch) point to the assignment of this species to the synonymy of *Chaetopleura lurida* (Sowerby, 1832), which is a common Panamic Province species occurring from Guaymas, Sonora, Mexico, in the Gulf of California, to at least as far south as Peru.

The above confirms the placement of *Lepidopleurus bullatus* in the synonymy of *Chaetopleura lurida* by THORPE (*in* KEEN, 1971), which now seems to be the correct assignment of the species.

Lepidopleurus bullatus calciferus Carpenter, 1857

Lepidopleurus bullatus calciferus Carpenter, 1857a:252, *nomen nudum;* 1857b:196. BRANN, 1966:45, fig. 245b; KEEN, 1968:434, plt. 59, fig. 96; THORPE (*in* KEEN, 1971): 877 (syn. of *Chaetopleura lurida* (Sowerby, 1832)).

Chaetopleura bullata calcifera (Carpenter, 1857). PILSBRY, 1892:32.

Chaetopleura (Chaetopleura) bullata calcifera (Carpenter, 1857). KEEN, 1958:524.

Holotype: British Museum (Natural History), Tablet No. 903 (Mazatlan Colln.).

Type locality: "Mazatlan; 1 sp. off Spondylus; *L'pool Col.*"

Remarks: Based on a photograph provided by Dr. Keen, the holotype seems to be a very small specimen with all valves in place in the girdle. I can see no reason for assuming that it is other than a younger specimen of the nominate species and, as such, should be assigned to the synonymy of *Chaetopleura lurida* (Sowerby, 1832), as indicated by THORPE (*in* KEEN, 1971).

Callistochiton duncanus Dall, 1919

Callistochiton duncanus Dall, 1919:512-513. THORPE (*in* KEEN, 1971):873.

Holotype: U.S.N.M. No. 218772.

Type locality: "Duncan Island, Galapagos, United States Fish Commission steamer *Albatross*."

Remarks: The holotype now consists of 5 separated valves only (head, tail, and 3 intermediates); no portion of the girdle is preserved. However, in his original description, Dall mentions the "velvety girdle, densely covered with minute whitish spicules," which occur on all of the specimens I have studied, especially those preserved in alcohol. This is not the type of girdle decoration for the genus *Callistochiton*, which calls for: "Girdle poreless, densely clothed with minute striated or smooth scales." (PILSBRY, 1893:260).

I found this species common in the low intertidal zone off the loading dock at the Charles Darwin Research Laboratory on Isla Santa Cruz (Indefatigable Island) during the Galápagos International Scientific Project of 1964, and have seen specimens from 4 other Galápagos Islands in addition to the holotype from Duncan Island, the type locality.

Callistochiton duncanus is a close counterpart of the Atlantic and Caribbean *Calloplax janierensis* (Gray, 1828) and consequently should be transferred from the family Callistoplacidae to the family Chaetopleuridae, with a consequent change in the name to *Calloplax duncana* (Dall, 1919).

A color slide of the holotype of *"Callistochiton" duncanus* Dall, 1919, is on file as CASIZ No. 1349 (AGS); CASIZ No. 1394 shows a complete specimen from Barrington Island, Galápagos.

Chiton jaspideus Gould, 1846

Chiton jaspideus Gould, 1846:143; 1852:325, plt. 27, fig. 414a; 1862:4. Thorpe (*in* Keen, 1971):877 (syn. of *Chaetopleura lurida* (Sowerby, 1832)); Abbott, 1974:401 (syn. of *C. lurida*).

Onithochiton jaspideus (Gould, 1846). Gould, 1862:242.

Chiton [Onythochiton] jaspideus Gould, 1846. Johnson, 1964:95.

Chaetopleura jaspidea (Gould, 1846). Thiele, 1893:380, plt. 31, fig. 12 (dentition).

Chaetopleura hennahi var. *jaspidea* (Gould, 1846). Pilsbry, 1894:70, plt. 10, figs. 29, 30.

Holotype: U.S.N.M. No. 5805.

Type locality: Callao, Peru (U. S. Exploring Expedition).

Remarks: The holotype is entire but slightly curled. It is dark reddish with lighter-colored areas on some of the valves. It is without doubt a *Chaetopleura*, showing the characteristic, low, sparse pustules on the lateral areas of the intermediate valves and the fine, longitudinal riblets on the central areas.

There are 3 separate museum labels with the holotype in various handwritings, all of which refer *Chiton jaspideus* to *C. hennahi* (Gray, 1828), which was collected originally at Callao, Peru, also. Neither the holotype nor the description and illustrations of it in the Manual of Conchology (Pilsbry, 1894) develop any criteria for separating the two as different species. Consequently, *Chiton jaspideus* Gould, 1846, should be relegated to the synonymy of *Chaetopleura hennahi* (Gray, 1828). Whether the next taxonomic step of assigning *C. hennahi* to the synonymy of *Chaetopleura lurida* (Sowerby, 1832), following Thorpe (*in* Keen, 1971) and Abbott (1974), is sound procedure cannot, in my opinion, be taken authoritatively until specimens of *C. hennahi* can be collected at Callao, Peru, and compared with the type in the British Museum. In addition, it would be desirable to make a comparison of the type specimens of both *C. hennahi* and *C. jaspideus* in order to confirm the fact that they are conspecific.

Color slides of the holotype of *Chiton jaspideus* Gould, 1846, are CASIZ Nos. 2199-2200 (AGS).

Nuttallina magdalena Dall, 1919

Nuttallina magdalena Dall, 1919:502. Smith, 1961:82, 86.

Chaetopleura (Chaetopleura) magdalena Dall, 1919. Keen, 1958:524.

Chaetopleura magdalena (Dall, 1919). Abbott, 1974:401.

Syntypes: U.S.N.M. No. 217924.

Type locality: "Magdalena Bay, Lower California, C. R. Orcutt."

Remarks: The syntypes of *Nuttallina magdalena* represent a fairly comprehensive growth series of 8, somewhat curled specimens preserved dry with the animals removed. One subadult is partially disarticulated, valves i, ii, and viii having been separated although valve i is missing. In his unpublished notes (1947) Berry states there were 9 specimens in the original lot although now there are 8. Dall gives the measurements of one of his syntypes as: l., 26; w., 12; h., 7 mm; the slit-formula is given 7 to 9 - 1 - 7 although the loose tail valve has 9 slits, which may well be within the limits of individual variation for the species. I hereby designate the largest specimen in the syntype series as the **lectotype** as it shows the sculptural characters of the species well; the remaining 7 syntypes would thus become **paralectotypes.**

The San Diego Museum of Natural History has a series of 15 specimens identified as *Chaetopleura magdalena* collected in Magdalena Bay at Ship Rock by Herbert N. Lowe, December, 1931 (SDNH No. 23676). One disarticulated specimen from this series has a slit-formula of 8 - 1 - 8. These unquestionably are topotypes.

For some time it has been obvious that Dall assigned his *Nuttallina magdalena* to the wrong genus. Keen (1958) transferred the species to *Chaetopleura* on the advice of Berry, but unfortunately assigned it incorrectly to *Chaetopleura s.s.*, on the tail valve of which the mucro is placed more or less in a median position. The terminally-placed mucros of all specimens in the syntype series of *C. magdalena* place it in the subgenus *Pallochiton* Dall, 1879, whose type species is *C. (P.) lanuginosa* (Carpenter in Dall, 1879). This species was omitted from Keen (1971).

The above would indicate the occurrence of 2 sympatric species in the subgenus *Pallochiton* on the west side of the Baja California Peninsula—*Chaetopleura (Pallochiton) lanuginosa* and *C.* (*P.*) *magdalena*. The other West Coast *Pallochiton* is *C.* (*P.*) *euryplax* Berry, 1945, from the upper Gulf of California, based on a population that is removed widely from the one on the Pacific side of the peninsula. This calls for a retraction of the statement made (SMITH, 1961:86) to the effect that "no true Pallochitons have been seen or reported from Magdalena Bay . . . ."

The questionable occurrence of 2 valid sympatric West Coast *Pallochiton* species on the Pacific Ocean side of Baja California had led to a detailed examination of available material, both dry-preserved and in alcohol by Dr. A. J. Ferreira based on his personal collection and in the collections of the California Academy of Sciences. Specimens examined were collected as far north as White's Point, Los Angeles County, California, to as far south as Magdalena Bay, Lower California, and included Ensenada (Todos Santos Bay), San Quentin Bay, Scammon's Lagoon, and Punta Abreojos. None was available from Cape San Lucas at the end of the Peninsula. Ferreira reports (*in litt.*, 25 July 1975):

> ". . . that there is considerable variation in the degree to which the typical sculpture of beaded lines in the central and lateral areas appears. In some specimens the beads are relatively large, very well defined, bold, [and] full; in others the whole sculpture is much more subdued almost to the point of being absent on some parts of the shells."

He concludes, given the evident variation in the strength of the sculpture both on the lateral areas, as well as in the longitudinal beaded lines on the central areas, that no valid basis exists for separating *C.* (*P.*) *magdalena* (Dall, 1919) from *C.* (*P.*) *lanuginosa* (Carpenter in Dall, 1879), there being no other criteria that would warrant keeping the two separate. From this information, it appears desirable to make a relatively wide allowance for the occurrence of individual sculptural variation between populations in this instance, and to treat *C. magdalena* as a synonym of *C. lanuginosa*.

Color slides of the largest syntype of *"Nuttallina" magdalena* are CASIZ No. 3137 (AGS) and Nos. 3262-3263 (Ferreira); those of a smaller syntype are Nos. 3138-3139 (AGS). A slide showing 3 specimens of *C. magdalena* from Magdalena Bay, collected by Lowe (SDNH No. 23676) is CASIZ No. 670 (AGS). Slides of *C. lanuginosa* collected at Punta Abreojos by A. G. Smith are CASIZ Nos. 664A-667A.

Ischnochiton marmoratus Dall, 1919

Ischnochiton marmoratus Dall, 1919:503. OLDROYD, 1927: 270-271; BURGHARDT & BURGHARDT, 1969b:13 (syn. of *Chaetopleura gemma* Dall, 1879). ABBOTT, 1974:401 (syn. of *C. gemma*).

Ischnochiton (Ischnochiton) marmoratus Dall, 1919. DALL, 1921:190; SMITH, 1947b:18 (listed only). SMITH & GORDON, 1948:207.

Holotype: U.S.N.M. No. 218735.

Type locality: "Pacific Grove, Monterey Bay, California; Mrs. Blood."

Remarks: Described from a single specimen, the holotype, which is preserved dry and fairly flat, with all valves in place in the girdle. Dall's measurements are: l., 7; w., 4; and h., 1.5 mm; the slit-formula is given as 8 to 10 - 1 - 8 to 9.

In his unpublished notes, BERRY (1947) identifies this specimen as a juvenile example of the fairly common Monterey Bay species *Chaetopleura gemma* Dall 1879. Examination of the holotype confirms this. Even Dall's description of the sculptural characters contains wording that is completely applicable to *C. gemma*. In partial extenuation for assigning this chiton to the wrong genus as well as to the wrong species, it might be pointed out that Monterey Bay specimens of *C. gemma*, more often than not, are colored a bright orange-red with the tail valve black. The holotype of *"Ischnochiton" marmoratus* has more somber hues, being rather dark with valve centers light brown and the rest of the valve areas dark green, which is a color phase more frequently collected toward the northern end of the range of *C. gemma*. *Ischnochiton marmoratus* therefore drops into the synonymy of *Chaetopleura (Chaetopleura) gemma* Dall, 1879.

A color slide of the holotype of *Ischnochiton marmoratus* is CASIZ No. 2205 (AGS).

Tonicia mixta Dall, 1919

Tonicia mixta Dall, 1919:515-516.

Chaetopleura mixta (Dall, 1919). THORPE (*in* KEEN, 1971): 879, fig. 42; ABBOTT, 1974:401.

Chaetopleura (Chaetopleura) mixta (Dall, 1919). KEEN, 1958: 524, fig. 37 (2 specimens).

Syntypes: U.S.N.M. No. 110345.

Type locality: "Angeles Bay, Gulf of California, W. J. Fisher."

Remarks: The syntype series consists of an entire specimen with all valves in place and another that has been disarticulated. The type label reads: "110345 / Tonicia mixta / Types / Dall / Aug. 1876 / Angeles B. / W. J. Fisher." The entire shell is herein designated as the **lectotype** and the disarticulated one as a **paralectotype** of *Tonicia mixta*.

actually there are 3 specimens
in this syntype lot (2 entire +
1 disarticulated). Can't tell
which one is the "lectotype" so
this is still a syntype lot (Nov. 1994)

Keen (1958) changed the incorrect generic assignment from *Tonicia* (fam. Chitonidae) to *Chaetopleura* s.s. (fam. Chaetopleuridae). The nearest relative of *Chaetopleura mixta* is *C. gemma* Dall, 1879, another small to medium-sized species with a range farther to the north: it is not even close to *Tonicia pustulifera* Dall, 1919, as Dall indicates, the latter species being correctly assigned to the genus *Tonicia* as will be discussed later in remarks on this particular species.

Chaetopleura mixta has been collected sparingly at various localities in the upper Gulf of California. Keen (1958) illustrated 2 specimens, one a so-called "paratype" in the S. S. Berry Collection, and the other from Cholla Cove, Sonora, Mexico. Thorpe (*in* Keen, 1971) illustrates a specimen from Tiburon Island in the Gulf of California in the collection of the Los Angeles County Museum of Natural History. None of these illustrations shows the sculptural characters of the species with adequate clarity.

Color slides of the syntype series are CASIZ Nos. 2178, 2183, 2184 (Dea Beach). Slides of specimens from the vicinity of Guaymas, Sonora, are CASIZ No. 674-676 (AGS).

Ischnochiton parallelus Carpenter, 1864

Ischnochiton parallelus Carpenter, 1864a:314, and reprint 1872:213; 1864b:618, and reprint 1872:104; Keen, 1958: 524 (syn. of *Chaetopleura (Chaetopleura) lurida* (Sowerby, 1832)); Thorpe, (*in* Keen, 1971):877 (syn. of *C. lurida*).

Chaetopleura lurida var. *parallela* (Carpenter, 1864). Pilsbry, 1892:34, plt. 12, fig. 50; Keep, 1904:348 (as "*livida*," a typ. err.).

Chaetopleura parallela (Carpenter, 1864). Dall, 1921:193; Oldroyd, 1927:287-288; Smith, 1947b:18 (listed only); 1947c:4; Palmer, 1945:100; 1958:267; Abbott, 1974:401 ("Is *lurida*?").

Syntypes: U.S.N.M. No. 4017; Redpath Museum, Montreal, Canada, No. 46.

Type locality: Cape San Lucas, Lower California.

Remarks: The syntypes in the U. S. National Museum of Natural History consist of an entire specimen herein designated as the **lectotype** and two additional separated valves (head and intermediate), which become **paralectotypes,** along with the specimen in the Redpath Museum. The museum label with the USNM specimens indicates them as "cotypes." The original description, republished in Oldroyd (1927), points to a genus name change for this species from *Ischnochiton* to *Chaetopleura* and for synonymizing it under *Chaetopleura (Chaetopleura) lurida* (Sowerby, 1832). This is confirmed by Dr. McLean's photographs of the USNM "cotypes"; it also confirms the correct assignment of the species by authors beginning with Pilsbry (1892).

Chaetopleura lurida is a common Panamic Province chiton that ranges from Punta Colorado, Guaymas, Sonora, Mexico, in the Gulf of California to at least as far south as Perú. Its range as far north as San Diego, California, as indicated by Dall (1921) and Oldroyd (1927) has not been confirmed and is doubtful.

Ischnochiton prasinatus Carpenter, 1864

Ischnochiton prasinatus Carpenter, 1864a:315, and reprint 1872:213; 1864b: 618, and reprint 1872:104. Keen, 1958: 524 (syn. of *Chaetopleura (Chaetopleura) lurida* (Sowerby, 1832)); Thorpe (*in* Keen, 1971):877 (syn. of *C. lurida*).

Chaetopleura lurida var. *prasinata* (Carpenter, 1864). Pilsbry, 1892:34; Keep, 1904:348.

Chaetopleura prasinata (Carpenter, 1864). Dall, 1921:193; Oldroyd, 1927:287; Burch, 1942:7; Smith, 1947b:18 (listed only); 1947c:4-5; Palmer, 1958-267; Abbott, 1974: 407 ("Is *lurida*?").

Holotype: U.S.N.M. No. 15892.

Type locality: Cape San Lucas, Lower California.

Remarks: The holotype has been disarticulated and the valves glued to an oval-shaped card in such a way as to overaccentuate the length of the valves in place in relation to their width, a situation shown in an excellent photograph provided by Dr. James McLean of the Los Angeles County Museum of Natural History some time ago. The pen-written museum label carries the designation "Type," and also has the phrase: "(= *lurida* Sby. / C. San Lucas)."

Carpenter (1864b) stated that this species was "possibly a form of *parallelus*" indicating he thought the two were closely related, which, in fact they undoubtedly are. Thus, the taxonomic situation with respect to *Ischnochiton prasinatus* is exactly the same as for *I. parallelus*, preceding, and it should be shown as a synonym of *Chaetopleura (Chaetopleura) lurida* (Sowerby, 1832). Perhaps it should be noted that the "vivid green" color, as described by Carpenter, evidently applies to an unusual color phase for the species and as such has no taxonomic significance in this instance. The colors on most specimens of *Chaetopleura lurida* generally trend toward a warm red-brown with occasional lighter markings.

MOPALIIDAE

Callistochiton aepynotus Dall, 1919

Callistochiton aepynotus Dall, 1919:511; 1921:194. Oldroyd, 1924:194; 1927:297; Smith, 1947b:18 (listed only; La Rocque, 1953:12; Burghardt & Burghardt, 1969:27 (syn. of *Mopalia cirrata* Berry, 1919); Abbott, 1974:399.

Holotype: U.S.N.M. No. 2~~5~~25448.

Type locality: "Puget Sound, in 37 fathoms rocky bottom, temperature 46°. U. S. Fish Commission."

Remarks: The holotype, indicated as "Type" on the museum label, is a badly preserved specimen consisting of a portion of the girdle with valves i-iv in place, plus the broken tail valve. It seems to be the only representative of the species despite Dall's phrase "one of the specimens." Examination of what is left of the holotype and comparison with specimens from the subtidal zone of *Mopalia sinuata* Carpenter, 1864, from the Pacific Northwest coast leaves no doubt that *Callistochiton aepynotus* should have been identified as the older-named Carpenter species. Assignment to the genus *Callistochiton* rather than to the genus *Mopalia* seems inexcusable in this instance. Placement of it as a synonym of *Mopalia cirrata* Berry, 1919, by the Burghardts (1969) may be incorrect although *M. sinuata* and *M. cirrata* are closely related.

A color slide of the holotype of *Callistochiton aepynotus* Dall, 1919, is CASIZ No. 2544 (AGS).

Mopalia celetoides Dall, 1919

Mopalia celetoides Dall, 1919:514; 1921:196. Oldroyd, 1927: 313; LaRocque, 1953:14; Burghardt & Burghardt, 1969b:28 (syn. of *M. imporcata* Carpenter, 1864); Abbott, 1974:403.

Mopalia (Mopalia) celetoides Dall, 1919. Smith, 1947b:19 (listed only).

Syntypes: U.S.N.M. No. 218771.

Type locality: "Forrester Island, Alaska; G. Willett."

Remarks: Both specimens in the syntype series are preserved flat and are complete with all valves in place in the girdles. However, the girdles have lost their dendritic setae although in some places the stubs of broken-off setae can be seen at the valve sutures. The type specimens have the following measurements (in mm):

Specimen	*Length*	*Width*	*Height*
Larger	12	5.5	2.5
Smaller	7.6	3.5	—

The larger specimen is designated herein as the lectotype, with the smaller becoming the paralectotype.

Based on a study of the types of *Mopalia celetoides* and comparison with available specimens of *Mopalia imporcata* Carpenter, 1864, from various West Coast localities as well as with the holotype of the latter species from Puget Sound (USNM No. 4499) I can find no valid characters separating the two. The name *M. celetoides,* therefore, should be treated as a synonym of *M. imporcata.* This is to be expected since Berry (1917:241), reporting on the chitons collected by the late George Willett at Forrester Island, Alaska, notes that *M. imporcata* was "apparently *the* common Mopalia in all the shallower depths," Willett's series consisting of a total of 29 specimens.

Color slides of the lectotype of *Mopalia celetoides* Dall, 1919, are CASIZ Nos. 2465-2467 (AGS), and of the paralectotype, No. 2468 (AGS).

Mopalia chloris Dall, 1919

Mopalia chloris Dall, 1919:513; 1921:196. Oldroyd, 1927: 311-312; Burghardt & Burghardt, 1969b:28 (syn. of *M. acuta* (Carpenter, 1855)); Abbott, 1974:403.

Mopalia (Mopalia) chloris Dall, 1919. Smith, 1947b:19 (listed only).

Holotype: U.S.N.M. No. 273686.

Type locality: "San Diego, California; Mrs. N. Davie."

Remarks: *Mopalia chloris* is based on a single specimen labeled "Type" on the museum label. It is a fairly well-preserved, entire specimen, which Dall did not attempt to disarticulate. The published type number (293686) is incorrect and should be No. 273686, as indicated above. The holotype measures: l., 19; w., 11; h., 3 mm.

Dall's description and a study of the holotype specimen leave no doubt that *Mopalia chloris* merely is a re-description of *M. acuta* (Carpenter, 1855) and should be placed in the synonymy of this latter species as anticipated by the Burghardts (1969b).

Color slides of the holotype of *Mopalia chloris* Dall, 1919, are CASIZ Nos. 3305-3308.

Mopalia goniura Dall, 1919

Mopalia goniura Dall, 1919:513-514; 1921:196. Oldroyd, 1924:198-199; 1927:312-313; LaRocque, 153:15; Burghardt & Burghardt, 1969b:31 (syn. of *M. sinuata* Carpenter, 1864); Abbott, 1974:403 (syn. of *M. sinuata*).

Mopalia (Mopalia) goniura Dall, 1919. Smith, 1947b:19 (listed only).

Holotype: U.S.N.M. No. 208703.

Type locality: "Granite Cove, Port Althorp, Alaska, in 16 fathoms, gravel, collected by W. H. Dall."

Remarks: Again, Dall has based a new species on a single specimen, which is curled and poorly preserved, some of the valves being broken. One of the intermediate valves and the tail valve are separate. Berry (1927) pointed out the possibility that *Mopalia goniura* might be the same as the rare *M. egretta* Berry, 1919, dredged by George Willett off Forrester Island, Alaska. However, this is a question that can be answered authoritatively only with the collection of additional specimens supplementing the few now available. Incidentally, should these two species prove to be conspecific, Berry's name has priority by 6 months as his initial paper describing *M. egretta* is dated January 6, 1919, while Dall's name carries a June 7, 1919 date.

Study of the holotype of *Mopalia goniura,* comparison with the holotype of *M. sinuata* Carpenter, 1864, and further comparison with other specimens of *M. sinuata,* leaves no alternative other than to assign it to the synonymy of the Carpenter species. Although this has been done already by the Burghardts (1969b) and by Abbott (1974) the validity of these earlier allocations now can be confirmed.

Color slides of the holotype of *Mopalia goniura* Dall, 1919, are CASIZ Nos. 2473-2475 (AGS).

Ischnochiton (Trachydermon) gothicus
Carpenter, 1864

Ischnochiton (Trachydermon) gothicus Carpenter, 1864b:612, and reprint 1872:98, *nomen nudum;* 1866:212. Pilsbry, 1892:74-75 (in sec. *Trachydermon*).

Trachydermon gothicus (Carpenter, 1864). Carpenter, 1864b: 649, and reprint 1872:135. Cooper, 1867:22; Pilsbry, 1894:65, plt. 15, figs. 28, 29; Keep, 1904:348; Palmer, 1945:100.

Chaetopleura gothica (Carpenter, 1864). Dall, 1921:193 (in sect. *Dendrochiton* Berry, 1911); Oldroyd, 1927:290; Burch, 1942:7.

Mopalia (Dendrochiton) gothica (Carpenter, 1864). Leloup, 1942:61; Smith, 1947b:19 (listed only); Abbott, 1974: 403.

Dendrochiton gothicus (Carpenter, 1864). Berry, 1919b:2-5, figs. 3, 4; Smith & Gordon, 1948:206; Palmer, 1958:284, plt. 32, fig. 3; Smith, 1963:148; Burghardt & Burghardt, 1969b:14, plt. 1, fig. 15 (in color); Burghardt, 1971:65.

Syntypes: Redpath Museum, Montreal, Canada, No. 13 (5 specimens); U.S.N.M. No. 16271.

Type locality: Santa Catalina Island, California.

Remarks: Thanks to Berry's (1919) detailed account and his definitive illustrations showing the distinguishing features of this tiny, low intertidal to subtidal zone species there now are no problems in its identification. Palmer (1958) covers the various generic, subgeneric and sectional assignments under which the species has been listed; this is reflected in the preceding synonymy. Berry (1911) in establishing the subgenus *Dendrochiton* in the genus *Mopalia,* family Mopaliidae, to accommodate a companion species, *Mopalia (Dendrochiton) thamnopora,* discovered later (1919) that Carpenter's *Ischnochiton gothicus* belonged in the same group. This led him to raise *Dendrochiton* to full generic rank where it still remains.

The U. S. National Museum of Natural History syntype specimen (No. 16271) consists now of only 3 incomplete valves and a complete tail valve, all apparently from the same animal; no vestiges of the girdle remain. A color slide of these valves, which shows the representative dorsal sculptural characters reasonably well, is CASIZ No. 2472 (AGS). According to Palmer there are 5 syntypes in the Redpath Museum Collection, one of which she illustrates (1958, plt. 32, fig. 3) showing a chiton with valves i, ii, iii, and iv in place. As this figured specimen probably represents a good example of the species, I hereby designate it as the **lectotype** of *Dendrochiton gothicus* (Carpenter, 1864) and the remaining 4 specimens in the Redpath Museum along with the loose valves in the U. S. National Museum of Natural History, as **paralectotypes.**

Dendrochiton gothicus, so far as known at present, has a range extending from the Channel Islands off southern California, to as far south as Guadalupe Island, Mexico. It appears to be fairly common in a depth of 25 fathoms [45.7 m] off Redondo Beach, Los Angeles County, California where it was dredged by Tom and John Q. Burch (A. G. Smith Colln., No. 5997).

Mopalia (Semimopalia) grisea Dall, 1919

Mopalia (Semimopalia) grisea Dall, 1919:514-515. Thiele, 1929:11; Smith, 1960:62; Burghardt, 1971:65.

Holotype: U.S.N.M. No. 218734.

Type locality: "Between Cape Pillar and Cape Horn, Tierra del Fuego; Stokes."

Remarks: The holotype is a complete specimen, preserved dry with foot and viscera removed. It measures: length, 20; width, 11; height, 3 mm. The dorsal surface is smooth even under low magnification, the background sculpture consisting of extremely fine, closely-spaced lines of growth. I would not describe this as "wholly microscopically decussate" as Dall does. The pairs of ribs are smooth and stand out prominently. The articulamentum of valves ii, iii, iv, and v are single slitted according to Dall although the slits in valve v are difficult to see in the holotype specimen; valves vi, vii, and viii are unslit. Lack of slitting in the tail valve is the sole basis used in erecting a new subgenus, *Semimopalia*, for *M. grisea*. While two of the intermediate valves are unslit in the holotype, this may not be a constant character and should be verified when additional specimens can be collected.

Although Dall describes the girdle as "leathery," under low magnification it appears sandy, similar to the finest grade of sandpaper. Under high magnification the girdle covering consists of very closely-packed, short, round spinules with rounded tops. Girdle "hairs" are unbranched and probably have a fleshy appearance on the living animal.

The smooth appearance of *Mopalia grisea* and especially the lack of slits in the tail valve set it apart from any other species of *Mopalia* described from the West Coast of North America or from Japanese waters. The relatively smooth sculpture of *Mopalia laevior* Pilsbry, 1918, from Puget Sound and southeast Alaska is somewhat similar but otherwise these two species cannot be said to be closely related in other respects. The occurrence of a species of *Mopalia* at the tip of South America so far removed from other species in this genus is a zoogeographic phenomenon of more than passing interest.

Color slides of the holotype of *Mopalia grisea* are CASIZ Nos. 3301-3304.

Mopalia imporcata Carpenter, 1864

Mopalia imporcata Carpenter, 1864b:603, and reprint 1872: 89, *nomen nudum*. Pilsbry, 1893:301-302, plt. 62, fig. 98; 1896:49; 1918:126; Keep, 1904:350; Berry, 1917:232, 241; Willett, 1919:28; Dall, 1921:196; Oldroyd, 1924: 197-198; 1927:308; Burch, 1942:7; Burch & Burch, 1943: 5; Smith & Gordon, 1948:206; LaRocque, 1953:15; Palmer, 1958:281, plt. 32, fig. 2; Thorpe, 1962:205, 207, 210; Burghardt & Burghardt, 1969b:28, plt. 3, fig. 45 (in color) (with syn. *M. celetoides* Dall, 1919); Burghardt, 1971:65; Abbott, 1974:403; Light's Manual (3rd ed.), 1975:465.

Mopalia imporcata Carpenter, 1864. Carpenter, 1864b:648, and reprint 1872:134; Cooper, 1867:22.

Placiphorella imporcata (Carpenter, 1864). Dall, 1879:306-307; Whiteaves, 1887:125; Taylor, 1895:97-98; Palmer, 1945:102.

Osteochiton imporcatus (Carpenter, 1864). Dall, 1886:211.

Mopalia (Mopalia) imporcata Carpenter, 1864. Smith, 1947b: 19 (listed only).

Syntypes: U.S.N.M. No. 4499; Redpath Museum, Montreal, Canada, No. 57.

Type locality: Puget Sound, Washington.

Remarks: Syntype No. 4499 in the collection of the Division of Mollusks, United States National Museum of Natural History, consists of 2 specimens. One is complete with all valves in place in the girdle, although badly curled; it measures: length, 8.7; width, 6.4 mm. The color of the dorsal surface is a very light brown over-all. The girdle is poorly preserved, having lost its characteristic dendritic setae. The dorsal sculpture of 2 heavily-beaded ribs marking off the lateral areas, and the slightly sinuate, longitudinal, subobsolete, beaded ribs on the central and jugal areas leave no doubt that the current concept of this species is correct. The second U. S. N. M. syntype is a whole animal from which all valves have been removed but which are either lost or mislaid as they now are no longer part of USNM No. 4499. According to Palmer (1958) the syntype in the Redpath Museum consists of disarticulated valves, not all of them complete, 6 of which she illustrates.

Because the larger syntype specimen in the U. S. National Museum of Natural History is complete and shows the dorsal valve sculptural characteristics of the species, it is designated herein as the **lectotype**, the other incomplete specimen and the loose valves in the Redpath Museum become **paralectotypes.**

Color slides of the lectotype of *Mopalia imporcata* Carpenter, 1864, are on file in the CASIZ Color Slide Series, Nos. 2463-2464 (AGS). A synonym is *M. celetoides* Dall, 1919.

Mopalia kennerleyi Carpenter, 1864

Mopalia kennerleyi Carpenter, 1864b:648, and reprint 1872: 134; 1865:59. Cooper, 1867:21, 1870:58; Dall, 1879:298, 305 (syn. of *M. wosnessenskii* (Middendorff, 1847)); Pilsbry, 1893:304 (syn. of *M. ciliata* (Sowerby, 1840)); Burghardt & Burghardt, 1969b:27 (syn. of *M. ciliata*); Abbott, 1974:402 (?syn. of *M. muscosa* (Gould, 1846)).

Mopalia muscosa kennerleyi Carpenter, 1864. Dall, 1921:195; Oldroyd, 1924:197; 1927:306; Leloup, 1942:50 (syn. of *M. (Mopalia) muscosa ciliata* (Sowerby, 1840) var. *wos-*

nessenskii); LaRocque, 1953:15; Palmer, 1958:282.
Mopalia (Mopalia) muscosa kennerleyi Carpenter, 1864. Smith, 1947b:19 (listed only).

Holotype: Location unknown; not in the U. S. National Museum of Natural History nor in the Redpath Museum, Montreal, Canada.

Type locality: Puget Sound, Washington.

Remarks: Carpenter's original inadequate description (1864) is:

> "*Mopalia Kennerleyi,* n.s. = *Grayi, anteá,* p. 603. nom. preoc. Sculpture fainter, olive with red; ridge angular; post. valve waved."

I interpret this to mean that the name *Grayi,* which Carpenter had applied originally, was found to be preoccupied, so he changed the name to *Kennerleyi* after the collector of the original specimens. A year later (1865) he amplified his description in Latin, which is translated and included in Oldroyd (1927). He stated, in effect, that Kennerley had collected only one specimen of this species.

Because the holotype of *Mopalia kennerleyi* has not been located, one can only guess what species of *Mopalia* Carpenter dealt with under this name. As shown in the above synonymy, it has been associated both with *M. muscosa* (Gould, 1846) and with *M. ciliata* (Sowerby, 1840), and also with *M. wosnessenskii* (Middendorff, 1847) due to the early confusion between these species. [The latter name has been applied more recently to a form of *M. ciliata* and probably should be treated as a synonym of this species.] Carpenter's reference to "shell like *M. muscosa* in form, character, and sculpture . . ." reads more like a description of *M. ciliata* than of *M. muscosa* as now understood, which no doubt is the reason why Pilsbry (1893) and authors following him have treated *M. kennerleyi* as a synonym of Sowerby's older species. Carpenter (1864b) also associated the name *"Swanii"* as a variety of *M. kennerleyi* for another chiton from Tatooche Island, Washington, collected by James G. Swan, but this has since been established as a valid species, *Mopalia swannii* Carpenter, 1864, by Berry (1951).

In the U. S. National Museum of Natural History, Division of Mollusk Collection there are 3 lots of chitons with the label name *"kennerleyi* Cpr.":

> U.S.N.M. No. 16230. *"Mopalia ciliata kennerleyi* Cpr." with "Neah Bay, W. T. J. G. Swan" printed on the museum label. This consists of 2 dried specimens, one about 14 mm long, the other a disarticulated subadult. Both these chitons belong to the species *Mopalia swannii* as defined and illustrated by Berry (1951: 219-220, plt. 26, fig. 15).
>
> U.S.N.M. No. 58673. *"Mopalia ciliata kennerleyi* Cpr. California & Vancouver, PPC" is on one museum label, with an older one reading *"Mopalia Kennerleyi* Vancouver PPC" in a different handwriting, possibly Carpenter's. In this lot there is 1 subadult, curled specimen, about 25 mm long, and 14 beach-worn valves. Although identification cannot be positive, at least *M. ciliata* and *M. swanii* appear to be represented.
>
> U.S.N.M. No. 58675. *"Mopalia ciliata kennerleyi* Cpr. Vancouver PPC" on the museum label. This consists of a single adult, curled chiton about 40 mm long and 8 beach-worn valves, the situation with respect to authoritative species identification being similar to the preceding lot from Vancouver Island, British Columbia.

Although it seems reasonable to assume that Carpenter had all three of these lots before him for study, none of them can be proved to be types of any sort; otherwise this would, in all probability, have been so indicated by him on an original label. Consequently, there seems to be no better procedure, than to follow Pilsbry's assignment of *Mopalia kennerleyi* Carpenter, 1864, as a synonym of *M. ciliata* (Sowerby, 1840) in the interest of taxonomic stability.

?Chaetopleura lactica Dall, 1919

?Chaetopleura lactia Dall, 1919:509-510.
Chaetopleura lactica Dall, 1919. Dall, 1921:193; Oldroyd, 1927:288; Smith, 1947b:18 (listed only); 1947c:4; Abbott, 1974:401.

Syntypes: U.S.N.M. No. 172900.

Type locality: "Catalina Harbor, California, W. H. Dall."

Remarks: The type lot consisted of 3 very small, curled specimens according to Berry's unpublished notes (1947) although there are now only 2, a head valve from one of them being separate. The entire specimen is herein designated as the **lectotype,** the other with the disarticulated head valve becomes a **paralectotype.**

Dall's description of this species and the measurements of one of them (l., 8; w., 4.5; and h., 2 mm) point to an identification as juveniles of *Mopalia acuta* (Carpenter, 1855). This is confirmed by the existing type specimens. Evidently Dall thought his original assignment to the genus *Chaetopleura* may not have been the correct one by inserting a "?" ahead of his published name although later (1921) he removed the "?" in listing it.

I have no hesitance in treating *?Chaetopleura lactica* Dall. 1919. as a synonym of *Mopalia acuta* (Carpenter, 1855) in view of the above, as has been suspected for some time. Color slides of the type specimens are CASIZ Nos. 3309, 3310.

Mopalia lowei Pilsbry, 1918

Mopalia lowei Pilsbry, 1918:125-126. DALL, 1921:196; OLDROYD, 1927:310; LELOUP, 1942:62 (listed only); THORPE, 1962:204, 207, 210; BURGHARDT & BURGHARDT, 1969b:29-30, 43, plt. 3, fig. 53 and front cover (in color); BURGHARDT, 1971:65; ABBOTT, 1974:403; LIGHT'S Manual (3rd ed.), 1975:461-462, 466.

Mopalia (Mopalia) lowei Pilsbry, 1918. SMITH, 1947b:19 (listed only).

Holotype: Academy of Natural Sciences of Philadelphia, No. 117951.

Paratype: San Diego Museum of Natural History, No. 23552 (Lowe Colln., No. 1538).

Type locality: "San Pedro, California, collected by Mr. Herbert N. Lowe."

Remarks: The holotype of *Mopalia lowei* was borrowed from the Academy of Natural Sciences of Philadelphia for study through the courtesy of that institution and the cooperation of Dr. Robert Robertson and Mrs. Virginia Orr Maes. It is H. N. Lowe's No. 1535; the label reads: "*Mopalia lowei* Pils. = *ciliata* Sby."

As now understood, *Mopalia lowei* is a valid species, distinguished particularly by its peculiar girdle decorations, which are unlike those on any other West Coast *Mopalia*. These are illustrated well in the color cover of BURGHARDT & BURGHARDT, 1969b, especially those making up the foot-fringe, although this specimen is one of the more highly-colored examples of the species. These set it apart from *M. ciliata* (Sowerby, 1840), which is a close relative and with which it has been confused until PILSBRY separated it in 1918.

Although originally collected at San Pedro, the present known range of *Mopalia lowei* extends along the central California coast at least as far as Bodega Bay, Sonoma County. Specimens equivalent or close to it have been seen recently from Sitka, southeast Alaska (Slattery Colln., Chico, California). It is a somewhat secretive, low intertidal to subtidal zone animal, often found nestling in rock crevices and frequently covered with detritus, which more often than not results in its being overlooked by chiton collectors.

Color slides of the holotypes of *Mopalia lowei* Pilsbry, 1918, are CASIZ Nos. 2674, 2675 (AGS). Color slides of other specimens are CASIZ Nos. 521-529 (AGS).

In the collection of the U. S. National Museum of Natural History, there is a specimen of *Mopalia* from San Pedro, collected by H. N. Lowe. It is U.S.N.M. No. 192389 labeled "*Mopalia imporcata lowei* Bartsch / Type." This was never described formally and therefore is a *nomen nudum*. It consists of a single specimen with valves i, ii, and iii in the girdle in one piece, and valves vi, vii, and viii in another valve v and vi being separate according to photographs supplied by Dr. James H. McLean. In describing *M. lowei* it may be right to assume that Pilsbry used Bartsch's original dedication of the species to Lowe, who collected the specimens. Although Pilsbry indicates more specimens were available in addition to the holotype and paratype, including younger ones, apparently he did not have access to U.S.N.M. No. 192389 as he did not mention it in discussing *M. lowei*.

Mopalia pedroana Willett, 1932

Mopalia pedroana Willett, 1932:101-102, plt. 7, fig. 1. LELOUP, 1940:3, 35-37, figs. 64-65, 81-84; BURGHARDT & BURGHARDT, 1969b:26 (syn. of *M. acuta* (Carpenter, 1855)); ABBOTT, 1974:403.

Mopalia (Mopalia) pedroana Willett, 1932. LELOUP, 1942:59; SMITH, 1947b:19 (listed only).

Holotype: Los Angeles County Museum of Natural History No. 1025.

Paratype: Academy of Natural Sciences of Philadelphia, No. 156264.

Type locality: Off San Pedro, California, in 15 fathoms, G. Willett, collector.

Remarks: Willett's description and excellent enlarged illustrations of the holotype of *M. pedroana* point to its identification as *Mopalia acuta* (Carpenter, 1855) as indicated by BURGHARDT & BURGHARDT (1969b). The holotype measures: l., 14.6; w., 9.6; and h., 3.4 mm. Willett says he dredged 3 more specimens in 15 fathoms [27.4 m] off the South Coronado Island, Lower California. The single specimen reported by LELOUP (1940) came from a depth of 50 m [27.3 fms.] in Monterey Bay, California. In my experience, dredged specimens tend to be much more highly colored than those found living in the intertidal zone.

Chaetopleura rosetta Bartsch

Chaetopleura rosetta Bartsch MS. BERRY, 1907.

Remarks: This is one of Bartsch's chiton names in manuscript that has found its way into the literature along with others that occur on museum labels only. It never has been published or validated and therefore is a *nomen nudum*. The specimen on which the published record is based presumably is in the S. S. Berry Collection. Redlands, California. BERRY (1917) identified it later as *Dendrochiton thamnoporus* Berry, 1911.

Mopalia sinuata Carpenter, 1864

?*Mopalia sinuata* Carpenter, 1864b:603, and reprint 1872:89, *nomen nudum; ibid.*:648, and reprint 1872:134; 1865:59. COOPER, 1867:22.
Mopalia (Placiphorella) sinuata Carpenter, 1864. DALL, 1879: 303, 306.
Placiphorella sinuata (Carpenter, 1864). TAYLOR, 1894:102; 1895:97; PALMER, 1945:102.
Osteochiton sinuatus (Carpenter, 1864). DALL, 1886:211.
Mopalia sinuata Carpenter, 1864. PILSBRY, 1893:303, plt. 62, figs. 95-97; KEEP, 1904:349; BERRY, 1917:232, 241; WILLETT, 1919:28; DALL, 1921:196; EYERDAM, 1924:28; OLDROYD, 1924:198; 1927:309; BURCH & BURCH, 1943a:5; SMITH & GORDON, 1948:206; LAROCQUE, 1953:16; PALMER, 1958:282-283, plt. 33, figs. 6-13; BURGHARDT & BURGHARDT, 1969b:31, 44, plt. 3, fig. 58 (in color) (with syn. *M. goniura* Dall, 1919); *ibid.*:reprint 1972:131; BURGHARDT, 1971:65, fig'd. (p. 64). ABBOTT, 1974:403 (with syn. *M. goniura*).
Mopalia cf. *M. sinuata* Carpenter, 1864. BERRY, 1922:451-452 and table 1, plt. 6, figs. 7, 8 (Pleistocene).
Mopalia (Mopalia) sinuata Carpenter, 1864. LELOUP, 1942: 52-53, text fig. 23; SMITH, 1947b:19 (listed only).

Holotype: U.S.N.M. No. 4473.

Type locality: Puget Sound, Washington, and vicinity, collected by Dr. Caleb B. R. Kennerley, naturalist for the Northwest Boundary Commission.

Remarks: The holotype is a complete specimen, preserved dry with all valves in place; it is slightly curled. The girdle has lost all of its original setal decorations, stubs of which can be seen at the valve sutures and in positions occupying an original outside row. Measurements are: l., 10.2; w., 6.0 mm. The color of the tegmentum is a very light cream. suffused with occasional brownish-orange areas, with a suggestion also of light bluish-green. The single ribs bordering the lateral areas of the intermediate valves are strong and well developed; the pitted character of the central areas also is well marked.

Mopalia sinuata is a beautiful but rather rare species, the unusually long girdle setae being a special character. It has been collected only in moderate depths, for example from 12-35 fathoms [22-64 m], Monterey Bay. California (SMITH & GORDON, 1948). and from 15-20 fathoms [27.4-36.6 m] off Forrester Island, southeast Alaska (BERRY, 1917). Synonyms include *M. aepynotus* Dall, 1919, and *M. goniura* Dall, 1919, as already indicated herein under the discussion of these two taxons.

Color slides of the holotype of *Mopalia sinuata* are deposited as CASIZ Nos. 2459-2471 (AGS).

Placiphorella borealis Pilsbry, 1893

Placiphorella stimpsoni (Gould, 1859). DALL, 1886:210 (in part).
Placiphorella borealis Pilsbry, 1893:309, figs. 14-17. BERRY, 1917b:13-14, plt. 8, figs. 3-5; plt. 10; DALL, 1921:196; OLDROYD, 1927:314-315; SMITH, 1947b:19 (listed only); YAKOLEVA, 1952:80, text fig. 35 (radula), plt. 5, figs. 3a-b; *ibid.*, Engl. trans. 1965:73, text fig. 35 (radula), plt. 5, figs. 3a-b; plt. 11, fig. 1; ISAO TAKI, 1964:26; 1962:34; BURGHARDT, 1971:65; ABBOTT, 1974:403, fig. 4739 (after Berry, 1917b).

Holotype: U.S.N.M. No. 106922.

Type locality: "Bering Island, Bering Sea (Grebnitski)."

Remarks: The holotype now consists of only 6 separate valves, 2 intermediate valves being missing. However, they show the configuration of the species and the sculptural characters well. BERRY (1917b) was able to amplify Pilsbry's original description based on 7 specimens dredged in 228 fathoms [417 m] off Cape Rollin, Simushir Island, Kurile Group (USFC Sta. 4803), by the USS *Albatross* in 1906, especially with respect to the girdle characters, which were unknown to Pilsbry as the girdle of the holotype was not available to him. YAKOLEVA (1952, 1965) gives the geographic range of *Placiphorella borealis* as: "North Pacific; Seas of Japan and Okhotsk and Bering Sea. Endemic to the Far Eastern subregion of the Pacific-Boreal region."

Color slides of the holotype of *Placiphorella borealis* are CASIZ Nos. 2243, 2244 (AGS).

Chiton (Molpalia) stimpsoni Gould, 1859

Chiton (Molpalia) stimpsoni Gould, 1859:165; 1862:118-119. JOHNSON, 1964:153.
Mopalia stimpsoni Gray. H. & A. ADAMS, 1854, 1:479.
Placiphorella stimpsoni (Gould, 1859). DALL, 1886:210-211; PILSBRY, 1893:307-309, plt. 62, figs. 84-87; BERRY, 1917b: 12-13, plt. 8, figs. 1, 2; plt. 9; DALL, 1921:197; OLDROYD, 1927:316; THIELE, 1929:11, fig. 4; LELOUP, 1942:13-15, figs. 5A-C (girdle setae and spicules); SMITH, 1947b:19 (listed only); YAKOLEVA, 1952:81, text fig. 36 (radula);

plt. 5, figs. 4a-b, frontis., fig. 1 (in color); *ibid.*, Engl. transl. 1965:76, fig. 36 (radula), plt. 5, fig. 4; Isao Taki, 1938:350-355, plt. 14, figs. 13, 17 (in color); plt. 21, figs. 3, 7-9; plt. 22, figs. 7-15; 1954:26, plt. 11, figs. 5, 6; 1962:34; Burghardt & Burghardt, 1969b:34; Burghardt, 1971: 65; Abbott, 1974:404, fig. 4742 (after Berry, 1917b).

Holotype: U.S.N.M. No. 1646.

Type locality: "Hakodadi [Hakodate] Bay [Japan], 25 fathoms. W. Stimpson."

Remarks: The holotype of *Placiphorella stimpsoni* is a somewhat worn, adult specimen, preserved dry and slightly curled. Its length is about 21 mm. Because of wear, the valves do not show the sculptural characters of the species especially well.

Taki (1938) provides the best discussion of the species, accompanied by excellent enlarged illustrations of the valves, girdle setae and spicules, and radular teeth. He also provides a number of additional references from the Japanese literature in addition to those included in the above synonymy. Yakoleva (1965) gives the geographic range as: "North Pacific; Sea of Japan and Bering Sea; along the Pacific coast of North America." Burghardt & Burghardt (1969b) give the latter range as extending from Bering Island, Bering Sea, to Cedros Island, Baja California, Mexico.

A color slide of the holotype of *Placiphorella stimpsoni* (Gould, 1859) is CASIZ No. 2246 (AGS). Slides of a better, rather highly-colored specimen from Chinhae, Korea, are CASIZ Nos. 2613-2615 (AGS).

CHITONIDAE

Nuttallina allantophora Dall, 1919

Nuttallina allantophora Dall, 1919:502. Keen, 1958:528; Smith, 1961:82; Thorpe (*in* Keen, 1971):908 (in genus *Liolophura*).

Nuttallina sp. cf. *allantophora* Dall, 1919. Steinbeck & Ricketts, 1941:553, plt. 26, fig. 6.

Holotype: U.S.N.M. No. 110360a.

Type locality: "Los Animas Bay, W. J. Fisher," Baja California.

Remarks: The species is based on a single specimen collected August, 1876, by Fisher according to the type label. The holotype is an entire but somewhat curled, dried specimen, dark colored except for a subtriangular lighter spot occupying about one-third of the center of the head valve. Much of the girdle decoration has been rubbed off but enough of the short, blunt spines remain to indicate that Dall's generic assignment to *Nuttallina* Carpenter in Dall, 1879 (Callistoplacidae) is incorrect, confirming both Berry's and Pilsbry's suspicions (Smith, 1961) that Dall had placed it in the wrong genus. The tail valve has the unslit, shelf-like insertion plate characteristic of the genus *Liolophora* Pilsbry, 1893 (Chitonidae). The specimen is close to if not conspecific with *Liolophura japonica* (Lischke, 1873). Thus, *Nuttallina allantophora* can be placed in the synonymy of the Lischke species from Japan with considerable confidence.

The reference to *Nuttallina allantophora* in Steinbeck & Ricketts (1941) is in all probability based on specimens of *Nuttallina crossota* Berry, 1956, a taxon unknown to Ricketts at the time. The illustration (plt. 26, fig. 6) represents a specimen of *N. crossota* so far as can be determined.

There is little doubt that the locality label for *Nuttallina allantophora* has been changed in some manner as no chitons of the genus *Liolophora* or of its related genus *Acanthopleura* Guilding, 1830, have been collected on the West Coast of the Americas. Other chitons attributed to Fisher's collecting activities in the Gulf of California in 1876 (*fide* Dall, 1919) include *Ischnochiton mariposa* Dall, 1919, *I. (Radsiella) aethalotus* Dall, 1919, *Acanthochitona angelica* Dall, 1919, and *Tonicia mixta* Dall, 1919, all but the first given different taxonomic assignments herein, as covered under each species name.

Color slides of the holotype of *Nuttallina allantophora* are deposited in the CASIZ Color Slide Series, Nos. 1992, 1993 (AGS).

Tonicia pustulifera Dall, 1919

Tonicia pustulifera Dall, 1919:516; 1921:195. Oldroyd, 1927: 299-300; Smith, 1947b:19 (listed only); Burghardt & Burghardt, 1969b:38, 45, plt. 4, fig. 80 (holotype, in color); Abbott, 1974:406.

Holotype: U.S.N.M. No. 218736.

Type locality: "San Pedro, California."

Remarks: The holotype is a badly preserved, small-sized *Tonicia* of a beige or cream color mottled principally along the valve side-slopes with dark greenish-brown. The color rendition of my 35 mm color slide of the holotype by Burghardt & Burghardt (1969b) is fairly accurate but all sculptural detail, including the rows of black eye-spots, has been lost in reproduction.

If this unique specimen actually came from San Pedro, California, it is undoubtedly adventitious there as no Tonicias ever have been collected along the coast of southern California. *Tonicia pustulifera* seems not to be conspecific with the relatively common Panamic Province species, *T. forbesii* (Carpenter, 1857), being much more weakly sculptured. I suspect it is more likely to be closer to a species of *Tonicia* from Perú or Chile. A mistake in labeling or an unfortunate switching of labels seems probable in this instance. The museum label accompanying the holotype has the species name spelled "oculifera" rather than *pustulifera*, as published.

Tonicia pustulifera Dall, 1919, must be considered a *nomen inquirendum* until other specimens like it can be collected and identified authoritatively. Color slides of the holotype are CASIZ Nos. 1985-1987 (AGS).

Lophyrus striatosquamosus Carpenter, 1857

Lophyrus striatosquamosus Carpenter, 1857a:252, *nomen nudum;* 1857b:192-193. Brann, 1966:43, fig. 692; Keen, 1968:433, plt. 59, fig. 91; Thorpe (*in* Keen, 1971):864 (syn. of *Chiton articulatus* Sowerby, 1832).

Chiton striatosquamosus (Carpenter, 1857). Pilsbry, 1893: 168; Keen, 1958:518.

Holotype: British Museum (Natural History), Tablet No. 897. Reigen Mazatlan Collection.

Type locality: "Mazatlan; 1 sp. off Spondylus calcifer; L'pool Col."

Remarks: The single specimen on which this species is based is a juvenile, as indicated by Carpenter's dimensions: "Long. .17, lat. .12, alt. .04", which convert to: l., 4.3; w., 3.0; and h., 0.9 mm. Carpenter refers to the "serrations of the margin in the only perfect specimen," which are shown in the sketch of the ventral side of the head valve published by Brann (1966). This, and the reference in his original description to a comparison with the young of *Chiton albolineatus* Broderip & Sowerby, 1829, and *C. articulatus* Sowerby, 1832, indicate that *Lophyrus striatosquamosus* belongs in the genus *Chiton*. It cannot be identified as *C. albolineatus* as the striking black and white color pattern of this species is apparent even in very young specimens; it is not shown in the photograph of the holotype supplied by Dr. Keen. Thus, its identity with another fairly common Mazatlan chiton, *C. articulatus* seems reasonable and its assignment by Thorpe (1971) as a synonym of Sowerby's species is probably correct. Following this taxonomic allocation results in eliminating another West Coast chiton name that otherwise would have to be left in the limbo of a *nomen inquirendum*.

ACANTHOCHITONIDAE

Acanthochitona angelica Dall, 1919

Acanthochitona angelica Dall, 1919:515. Keen, 1958:518; Thorpe (*in* Keen, 1971):866 (?syn. of *A. avicula* (Carpenter, 1864)); Abbott, 1974:4-7 (?syn. of *A. avicula*).

Holotype: U.S.N.M. No. 11-346.

Type locality: "Angeles Bay, Gulf of California, W. J. Fisher."

Remarks: Study of the holotype of *Acanthochitona angelica* and comparison with specimens of *A. avicula* (Carpenter, 1864) collected both at San Diego, California, and in the Gulf of California leads to the conclusion that the two are conspecific. The sculptural differences upon which Dall relied for separating *A. angelica* appear to be well within the limits of individual variation exhibited by *A. avicula*. The color patterns of *A. avicula* are quite variable, so the scarlet color of the dorsal surface of *A. angelica* (now faded to an orange-red) is no more than a color phase that is not entitled to taxonomic recognition. I have seen at least one other bright red *A. avicula* from the Gulf of California.

Acanthochitona avicula was omitted from the first edition of Keen's *Sea Shells of Tropical West America* (1958) as this species was not then certainly known from the Gulf of California although it has been collected in the Gulf since. Specimens close to or conspecific with it have been collected sparingly in the Galápagos Islands, which could constitute a considerable southerly extension of its geographic range.

Color slides of the holotype of *Acanthochitona angelica* Dall, 1919, are CASIZ Nos. 2248-2250 (AGS).

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The foregoing article by the late ALLYN GOODWIN SMITH was being set in type at the time of the unexpected death of the author. Consequently, proof reading was undertaken by Dr. Peter Rodda and Mr. Barry Roth of the California Academy of Sciences; page proofs were read by Mrs. Jean M. Cate and Mrs. R. Stohler. However, full responsibility for any typographical errors rests with the editor, while Mr. Smith alone is to be credited for content, conclusions and presentation.

R. Stohler, Editor.